

THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF GOOD LIGHTING

Official Organ of the Illuminating Engineering Society

FOUNDED IN LONDON 1908

Edited by
J. STEWART DOW

OIL
GAS
ELECTRICITY
ACETYLENE
PETROL-AIR
GAS
ETC.

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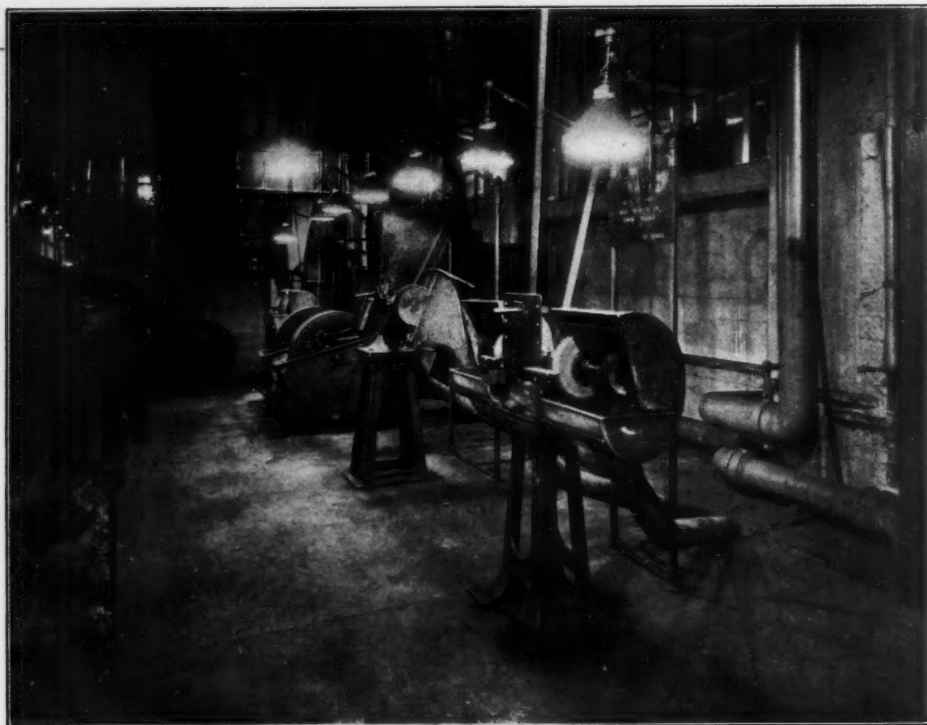
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THE GAS LIGHT & COKE COMPANY, HORSEFERRY ROAD, WESTMINSTER, S.W.1

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Architectural Lighting

ARCHITECTURAL lighting," which was dealt with by Mr. Waldo Maitland in his paper before the Illuminating Engineering Society on March 19th, has been the subject of much discussion recently, and has been the subject of reference in our journal on several occasions. Mr. Maitland naturally opened his paper by an attempt to define this term, which in fact is applied to very diverse modes of lighting, some of which bear little relation to architecture. The best method of getting an impression is doubtless to witness demonstrations—such as those so effectively displayed at the E.L.M.A. Lighting Service Bureau and also at some of the chief stores in London. Methods of lighting described as "architectural" or "Modernistic" usually involve two main features, the adoption of concealed lighting in some form and the use of supplementary devices, brackets or portable units of low luminosity and unusual shape or design, which help to counteract any impression of "flatness."

We think, however, that such methods, ingenious and original as they may be, do not in themselves deserve the description of "architectural lighting." We prefer Mr. Maitland's suggestion that the "chief characteristic of this mode of lighting is the fact that it is built into the fabric of the building and forms an integral part of the architecture." Lighting of this kind should have the quality of revealing surroundings and making a pleasant picture without attention being concentrated on the lighting devices themselves. Conventional types of lighting fittings, though they may fulfil practical requirements well, are, in a sense, excrescences—they give the impression of having been added to the room after the design of its structure was complete. In the case of architectural lighting the illuminating appliances should lose their identity in the general architectural scheme, and in buildings of distinction their primary use should be to reveal the architecture.

The idea is as yet in its infancy, and it should not be assumed that existing methods of lighting from bowls, chandeliers, brackets, etc., will quickly become obsolete. We assume that both methods of lighting will continue side by side. The introduction of modern illuminants into ancient interiors planned in the days of candles inevitably introduces some element of incongruity. In such cases it is inevitable that one should aim at preserving the atmosphere of the past. The architect would rarely countenance "architectural lighting" in its modern sense, though in reality this term might here be justly applied to the use of conventional fittings,

which would be more in keeping with the ancient architecture than such modern devices as cove-lighting or artificial windows.

It is chiefly in the case of modern buildings that the new methods have opportunities. The lighting of a building, like the architecture, should express the age. In the buildings of the past the architect tends to preserve forms of fittings associated with the use of candles, even though the convenience of electric lighting cannot be dispensed with. But in the case of a modern building, designed and erected in the present age of electric lighting, one may justly contemplate a departure from the conventional fittings and the introduction of entirely new devices which electric light makes possible. Such devices should, however, be built into the fabric of the building. The evolution of a new art in lighting is impossible if the conditions of illumination are only studied when the plans of the building are complete.

Obviously, therefore, "architectural lighting" cannot make real progress without the co-operation of the architect. His aid is indispensable for the reason indicated above, but also because the instinctive appreciation of "fitness," which the study of architecture involves, must be applied if the lighting of the future is to become really an "art"—a vehicle for artistic creative skill. It follows that the lighting of any new building of distinction should be considered as an individual problem. It is impracticable to apply mass-production methods to architectural lighting in the true sense of the word, though such methods may naturally be used to some extent in the manufacture of implements used, e.g., lamps, reflectors and translucent glass.

Hitherto, in speaking of architectural lighting, people have visualized mainly the lighting of interiors. But there is another field—the lighting of the exteriors of buildings, which should likewise be raised to the level of an art and has great possibilities. In floodlighting, as at present practised, we have the germ of the process, at present applied under considerable difficulties. With the co-operation of the architect and the deliberate design of a building with a view to pleasing appearance by artificial light as well as in daylight, great things might be done.

Originally interiors and exteriors of buildings were considered solely with a view to their appearance by *daylight*. But to-day appearance by artificial light is in many cases equally, and in some cases even more important, and this may profoundly influence the architecture of the future.

Industrial Research

THE Report of the Department of Scientific and Industrial Research for the year 1927-28 is a comprehensive publication of more than 200 pages. It is evident that the scope of its work is continually extending, though we observe that the expenditure was, in fact, somewhat less than in the previous year.

The researches conducted under the Department fall into two broad categories, those of general and national importance, such as other bodies could not readily undertake, and investigations which are likely to prove of direct benefit to certain industries and are undertaken mainly by their respective Research Councils.

The work of the Illumination Research Committee is briefly summarized. Much of this is familiar to our readers, but we may recall, as of special importance, the investigation into the lighting of compositors' rooms, the efforts made to discover means of preventing pictures and museum specimens from fading under the influence of light, and the study of the permissible daylight factor in rooms devoted to office work. Other researches now in progress include an enquiry into the conditions of illumination requisite for Jacquard looms and for paper-making. Progress is also being made with the research into the relation between glare and visibility in street lighting, for which purpose experiments are being made on a model street.

It should now be recognized that the Department is firmly established and has fully justified its existence. We would like to take this opportunity of expressing our appreciation of the interest which the Department has taken in illumination, and of the useful work which the members of the Illumination Research Committee—working, be it noted, in a purely honorary capacity—have done. This work is only typical of the numerous researches of other committees acting under the aegis of the Department. The fact that busy technical and scientific men are still willing to give their services so ungrudgingly for the national benefit is an encouraging sign in this somewhat commercial age.

Let us now turn to another feature of the Department's work, research of a more industrial character. Several results of considerable practical value are reported. Amongst these may be mentioned the new woollen ring spinning frame introduced by the Wool Research Association and a valuable new alloy for coating electric cables. The Industrial Research Associations, in spite of certain financial difficulties, are gradually securing the confidence of the industries they serve. When they were first formed co-operative research in industry was an experiment, and a certain degree of State aid was necessary. But, now that 10 years have passed, there is a natural feeling that the associations should receive the requisite financial support from the industries they serve.

The aggregate annual expenditure by all the Research Associations does not exceed about £200,000. This sum is not more than would be considered necessary by many single industrial research associations at home and abroad, which represent some of the greatest manufacturing and exporting industries of the country. Much has been done, considering the present limited expenditure, but we hope that the industries of this country will soon come to realize the benefits of research more fully and undertake financial responsibility for this work on a generous scale.

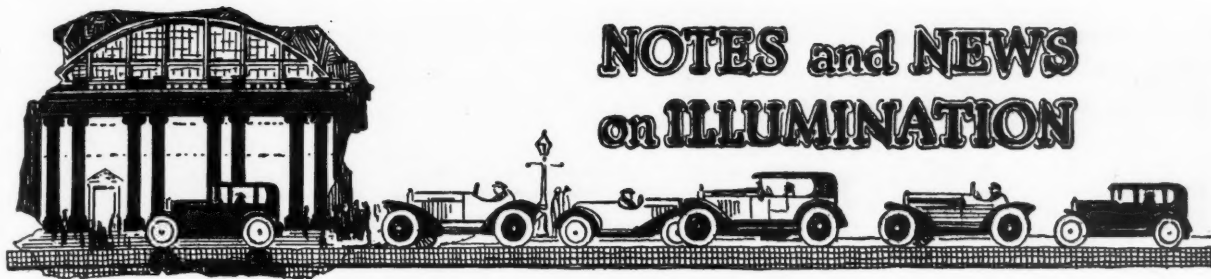
Lighting of Hospitals

THE lighting of hospitals includes numerous special problems, one of the most important of which is the lighting of the operating table. This topic has been recently discussed by Mr. J. R. Cravath in *The Electrical World*. He points out that the conditions are exceptional. The surgeon may have to examine minutely a cavity in cut living tissue, a material which may reflect less than 10 per cent. of the light impinging upon it. The production of sufficient brightness in such a dark cavity is quite a different problem from producing adequate brightness of a horizontal surface. Taking these facts into consideration, a horizontal illumination of at least 100 and preferably up to 1,000 foot-candles seems justified.

This high degree of illumination must also be achieved in such a way that inconvenient shadows from the surgeon's body or implements are eliminated, and yet the illumination should not be "shadowless." Special units involving the use of concentric lenses and mirrors have been devised to meet such conditions. Naturally the provision of such a high local illumination involves a corresponding general illumination throughout the remainder of the room in order to avoid excessive contrasts. The consumption of energy in lighting an operating theatre is therefore necessarily heavy. Hospitals, however, should recognize that this is a case where only the very best lighting conditions are admissible.

The expenditure involved in lighting the table is naturally less when the lighting unit can be brought relatively near the work. If lighting from a number of units mounted near the ceiling is adopted the consumption is higher, but it is a manifest advantage to have such units well out of the way. In a useful article in *Light* Mr. K. M. Reid has recently shown some striking illustrations of methods of lighting adopted in hospitals in Cleveland, Washington and elsewhere. The arrangement adopted in the Cleveland clinic—an installation, in recesses in the ceiling, of a series of Macbeth "daylight" units equipped with diffusing reflectors—seems excellent. In another hospital light is furnished from a large diffusing artificial skylight, an arrangement which has the advantage of minimizing the risk of dust falling on the operating table below, as the glass surface can be kept scrupulously clean.

Mr. Kirk also discusses the lighting of other sections of a hospital, including the wards. We recall that Mr. Darch, in criticizing the methods of lighting still in use in some hospitals, once quoted the dictum of Miss Florence Nightingale that the very first requirement in a hospital is that it should do the patients no harm! Certainly the exhibition of unscreened filaments to the eyes of a person lying in bed is inexcusable. An effective illustration in Mr. Kirk's article shows the lighting of a ward in the Sibley Hospital, Washington, by indirect units. We are not quite sure whether even a mildly illuminated ceiling should be constantly exposed to the eyes of persons lying in a recumbent position and looking upward, but the method is certainly a great advance on those very frequently adopted. There is much to be said for the use of local lights attached to the bed rail immediately behind a patient's head, supplemented by a subdued general lighting; but in this case the error of allowing the lamp to be visible to the eyes of a patient in a bed on the opposite side of the ward must be carefully guarded against.



Association of Public Lighting Engineers

PROGRAMME FOR BOURNEMOUTH.

At the gathering of the Association of Public Lighting Engineers held in connection with the British Industries Fair in Birmingham last month, the President, Mr. J. F. Colquhoun, presented an illustrated summary of his experience during his visit to the International Illumination Commission in the United States. We have already referred to this instructive report.* The opportunity was also taken to discuss the preliminary arrangements for the forthcoming Annual Conference and Exhibition of the Association, which will take place at Bournemouth during September 9th-12th. On the evening of the first day, September 9th, there will be a reception of members and delegates by the Mayor. Tuesday and Wednesday, September 10th and 11th, will be devoted to the Presidential Address and papers, and on the latter day the Association dinner will be held in the Town Hall. On the final day (Thursday, September 12th) there will be various agreeable excursions to the Isle of Wight, the New Forest, etc. Granted fine weather, the gathering at Bournemouth should be exceptionally enjoyable. We understand that there are interesting developments in public lighting at Bournemouth which will repay examination. The Association is also arranging the usual exhibition of lamps and appliances used in public lighting, and no doubt there will again be interesting novelties to record.

A Striking Lighting Installation

An illustration of the recognition that lighting plays an important part in the equipment of a modern business concern is afforded by the new Imperial Chemical House, the headquarters of Imperial Chemical Industries Ltd. Artificial daylight is used throughout, and this is believed to be the first office building to use this type of lighting exclusively. In the offices a general illumination of 4 foot-candles is provided, and in the corridors (where no natural lighting is provided) a maximum of 6 foot-candles is attained. Equally interesting is the method of applying the light. In the offices lamps are concealed in glazed recesses in the ceiling. Octagonal diffusing ceiling fittings are used in the conference rooms and elsewhere. The lighting of the Directors' room is unique. Illumination is afforded by reflectors fitted with daylight lamps and a lifting device—a species of miniature electric life—is provided to raise a portion of ceiling in order to allow access of light into the room. Additional electric devices control the intensity of the light. In practice, by merely pressing a button, the ceiling is lowered and lamps are switched on. A second pressing of the button causes the intensity of the light to be diminished by 50 per cent. A third pressing of the button causes the ceiling to be raised once more and the lamps to be extinguished. The lighting of other sections of the building, likewise based on the use of artificial daylight, presents novel features. The building has approximately 3,080 lighting points, and the connected lighting load is approximately 400 kilowatts. Altogether about 43 miles of cable and wire are used in the electric circuits of the building.

Modernizing the Lighting of St. George's Chapel

It is reported that St. George's Chapel, Windsor, after nearly 500 years of candle-lighting, followed alternately by oil and gas, is now to have electric light. Complaints have not infrequently been made of the inadequacy of candle light in such a vast building, but, as in other cases of the kind, the authorities have been reluctant to depart from the traditional method of lighting. If, as is stated, candle lighting has cost the chapel between £200 and £300 a year, the introduction of adequate electric lighting ought not to occasion additional running expenditure. We hope, however, now that this change has been agreed upon, that every effort will be made to secure that the new lighting is not incongruous. It is strange that in some of these cases where new illuminants have been long resisted the authorities seem to have been content to sanction methods the reverse of pleasing, and have seemed quite unaware that the exhibit of unscreened filaments is not a necessary evil! It may be admitted that it is sometimes difficult to harmonize the introduction of electric light with an ancient interior traditionally lighted by candles. But much can be done to smooth away the apparent anomaly, and even to achieve new and pleasing effects unattainable by the more primitive method of illumination.

The Lighting of Picture Galleries and Museums

Whilst London, in common with some of the Continental cities, possesses unique art treasures, it may be admitted that the buildings for housing them are not ideal, and that the lighting, in particular, is capable of improvement. As the author of a suggestive contribution in this journal recently pointed out, the United States is in some respects in a more fortunate position. It enjoys the advantage that the leading museums have been designed exclusively for the purpose in view and at a comparatively recent date, when more enlightened views both as regards the structure of the building and the design of the lighting prevailed. A notable instance is the Philadelphia Museum of Art, a building of fine proportions, described at the Convention of the American Illuminating Engineering Society last September. The lighting arrangements of this building are particularly interesting. Apparently little reliance is placed on daylight for the illumination of the main exhibition rooms, and this has freed the architects from the necessity of providing for skylights—an advantage from the standpoint of appearance of roofs and also a convenience so far as artificial lighting is concerned. Incidentally this decision is supported on another ground—that the fading of colours can be minimized and possibly prevented if artificial light only is used. The design of the artificial lighting, however, is such as to bear a close resemblance to natural lighting. Artificial daylight is used, and the light is admitted from artificial clerestory windows, apparently designed with considerable skill. The illuminations furnished are generous, values of 4 to 5 foot-candles horizontally and 15 to 20 foot-candles on the vertical surfaces of pictures being mentioned. The adoption of artificial lighting, which, unlike daylight, is under strict control, is also helpful in avoiding that long-standing difficulty in galleries—the troublesome direct reflection of light from the more or less shiny surfaces of pictures.

* *The Illuminating Engineer*, Feb., 1929, p. 30.



Public Lighting in Milan

In a recent issue of *Lux* M. Cohu describes the lighting of Milan, which seems to be developing on modern lines. Although a number of arc lamps are in use, the greater part of the lighting is now effected by means of gasfilled incandescent lamps in refractor-units. Apparently the lamps are worked on a constant current system and operate to yield 15,000, 10,000 and 6,000 lumens. In many cases central suspension is adopted, in which case the mounting height is 8 to 8½ metres (say 24 to 26 ft.). The average illumination in main streets is given as 7 to 8 lux (approximately 0.7 to 0.8 foot-candles) whilst in the boulevards about half this amount is provided, and in still less important streets 1 to 3 lux. The article contains illustrations of the lighting of important public squares, etc. Chief amongst these are the Place Julius César and the Place de la Cathédrale—the latter being illuminated by somewhat special methods involving the use of clusters of lamps in opaline globes, mounted on high masts and effectively showing up the exterior of the cathedral. Public lighting in Milan has been systematically improved from 1926 onwards. In that year there were 13,117 lamps in use, giving a total flux of 32,730,000 lumens. On April 30th, 1928, the lamps in service had increased to 14,895, an increase of 122 per cent., but the total flux of light furnished had risen to 46,100,000 lumens—an increase of 41 per cent.

Floodlighting in Germany

In our last number we commented upon the development of floodlighting in France. We have before us, in the *Siemens-Schuckert Review*, some excellent examples of recent installations in Germany. One of the most effective of these is the view of the National Gallery of Berlin, illuminated by night. The manner in which the pillars of this building, designed in the Greek style, are silhouetted against the bright background is quite striking. Other pleasing views are those depicting the Cathedral at Mainz and the Münster Town Hall.

Industrial Lighting

The same publication contains a suggestive contribution by Herr Carl Meller on "The Influence of Type of Drive of Machine Tools on Workshop Lighting." The effect of a forest of belts on both natural and artificial lighting deserves to be better appreciated. It is illustrated in this article by two photographs, showing the striking contrast in conditions in the same shop, in the one case with machines driven from above by belting, in the other with the same machines equipped with individual drive. Naturally belting obstructs the access of daylight through windows. In two shops studied the improvement in natural lighting resulting from the adoption of the direct drive was respectively 14 per cent. and 73 per cent. It is mentioned, as a curious fact, that hitherto effort has been concentrated almost exclusively on the improvement in output to be secured by better artificial lighting. Actually improvements in natural lighting may be quite as important—especially as the great part of industrial work is still done by daylight. In the case of artificial lighting, needless to say, the elimination of belting greatly simplifies the work of the illuminating engineer. Moving belts are apt to cast troublesome shadows, and it is a great advantage to be able to rely on overhead lights and to have a clear view throughout the room. The article also contains some data on improvements in output resulting from better lighting.

An Illuminating Engineer's Home

It is not every expert on lighting who cares to describe the lighting of his own home for public comment. On the principle that the cobbler's children are the worst shod, it is to be feared that lighting experts are sometimes less exacting in regard to their own requirements than those of clients. We notice, however, in *Light* that Mr. J. M. Luckiesh has illustrated very fully the lighting of his own home in Cleveland, which is described as "a modernized Norman French home in which the spirit of the past mingles with the comfort of the present." The exterior of the house makes a pleasing picture, and some charming views of the interior are shown. These seem to bear out the author's conception of a mingling of modern methods and old-time atmosphere. In one of the living rooms use is made of silk-shaded candle-brackets, but a novelty is provided in lighting from an "artificial window" on the stairway. In other rooms candle fittings and silk-shaded portable lamps are likewise adopted, but the bedrooms and bathrooms exemplify modern methods, and the recreation room is handled on original lines by means of a combination of concealed lighting from wall-units (concealed in kegs) and illumination penetrating through the frosted window. Near the entrance to the garden the author's name and the number of the house are boldly indicated on a panel, illuminated from within and mounted in a decorative wooden frame—a courtesy and convenience which visitors will appreciate.

Incandescent Lamps in the Kinema Studio

In the early days of film production studios were equipped almost exclusively with arc lamps, later with a combination of arcs and mercury-vapour lamps, these sources being selected for their high actinic value. But at the present time, when such large sums are expended on production, less importance is attached to energy consumption and more to the advantages of lighting units for special kinds of work, with the result that the equipment of the studio is more varied and comprehensive. In particular the high-power incandescent lamp has been increasingly used. One reason for this is that the photographic recording of coloured surfaces is more natural, especially when panchromatic plates are used. This is illustrated in a recent article in *The Electrical World*, which contains a diagram showing how closely the distribution in the spectrum of the energy of the incandescent lamp and the sensitiveness of the panchromatic plate are complementary. Incandescent lamps have other advantages, such as cleanliness, quietness and ease of operation. Less "make-up" is necessary on the part of actors, and the fact that lamps can be gradually brought up to full brilliancy is often an advantage. High candle-power units, capable of furnishing from 200 to 1,500 foot-candles over areas 3 ft. to 12 ft. in diameter and at distances of 12 ft. to 30 ft., are now in use, especially for "modelling" purposes, i.e., to give emphasis to certain actors and create an impression of depth. Apparently lamps up to 10-kw. capacity are now used in this way. As the scenes to be filmed are continually varying, standardization of electric-lighting equipment is impracticable. Flexibility is an important consideration, and many varieties of lighting units are needed.

TECHNICAL SECTION

COMPRISING
Transactions of The Illuminating Engineering
Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

Problems in Illuminating Engineering

(Proceedings at the Meeting of the Illuminating Engineering Society, held in the Lecture Theatre of the Home Office Industrial Museum, Horseferry Road, Westminster, on Tuesday, February 19th, 1929.)

IN our last issue* we gave a general account of the meeting of the Illuminating Engineering Society on February 19th, which was devoted to a series of contributions on "Problems in Illuminating Engineering." In what follows we give a fuller illustrated account of the installations described.

THE LIGHTING OF THE DAVIS' KINEMA THEATRE,

The first item on the programme was a description, by Mr. BASIL DAVIS, of the lighting of the Davis' Kinema Theatre at Croydon. The lighting of this theatre, which is on novel lines, is designed to meet the need for colour as a supplement to the display of the ordinary film. In many modern kinema theatres the musical interlude is now frequently associated with spectacular colour lighting. At Croydon approximately 5,000 coloured lamps are provided for the purpose. There are over 600 lamps, coloured red, blue and green, concealed in the proscenium arch, each colour being controlled by a separate dimmer. In the centre of the main dome, which spans the greater part of the auditorium, a smaller dome is inset. Nearly 700 coloured lamps are concealed round the bases of these domes and are likewise under separate control, so that the main and subsidiary domes can be flooded with contrasting or complementary colours. There are also three lesser domes over the balconies which are similarly lighted and controlled. The fluting of the proscenium walls, to the right and left of the arch, contributes to the striking effect when the coloured light is applied. By a system of side lighting at an acute angle from 600 lamps, made up of three equal banks of red, blue and green, the sides of the fluting can be illuminated in contrasting colours. These colours can be dimmed and changed gradually, so that the spectator sees stripes of colour extending the whole height of the proscenium, one colour merging into another and the whole gradually changing.

The proscenium arch, the domes and the fluting are the main features of this unusual scheme, but there are other features of interest, such as the use of supplementary "modernistic" pendant fittings, also fitted with changing coloured light. For the stage lighting about 250 clear and coloured lamps are used.

The coloured lighting is applied only during special intervals in the programme. During other intervals a distinct but equally interesting system of lighting is introduced. In these circumstances the whole of the auditorium is carried out with daylight lamps, which give full effect to the delicate shades and detail of the decorative scheme. The Davis' Kinema Theatre is believed to be the first in this country to adopt lighting with daylight methods in its entirety.

The impression of "coldness" sometimes associated with such daylight illumination does not arise, and this

is attributed largely to the careful selection of colours for the interiors, in which varied shades of grey play an important part.

Although the most striking lighting effects are obtained in the auditorium, there is much of interest in the lighting of the foyers, the tea balcony and the rotunda, and the exterior is floodlighted with eighteen 500-watt units, rendering the building a striking feature in the Croydon High Street.

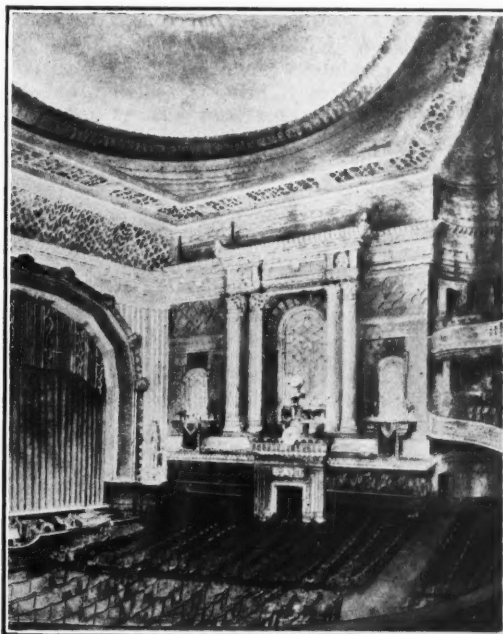


FIG. 1.—A View of the new Davis' Kinema Theatre at Croydon.

THE LIGHTING OF THE NEW PICCADILLY UNDERGROUND STATION.

Mr. S. G. ELLIOT then gave an account of the methods of lighting adopted in the new Underground Station at Piccadilly, which presents a number of interesting features.

The new station at Piccadilly Circus, which was opened to the public on December 10th, 1928, may (for the purpose of these notes) be divided into six sections, namely:—

(A) *The Short Passageways and Stairways connecting the Four Platforms with the Escalators.*—The lighting here is carried out similarly to the standard methods adopted at the other Tube stations, viz., by utilizing metal screens to hide the lamps in "one-way" passages, and glass shades in "two-way" passages: this calls for no particular comment.

* *The Illuminating Engineer*, March, 1929, p. 59.

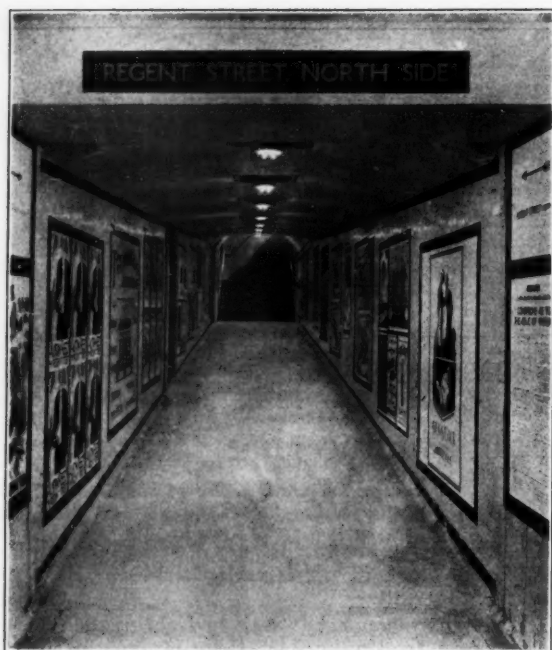


FIG. 2.—Showing method of Lighting Passages in the new Piccadilly Underground Station.

The illumination on the stair-treads is 2 foot-candles, and in the passageways at 3 ft. above floor level averages 1.5 foot-candles, with a minimum of .7 foot-candle.

(B) *The Four Escalator Tunnels.*—Three tunnels contain three escalators each, and one tunnel contains two escalators. The lighting is carried out by the indirect method; 60 bronze standards of a new design, with angle reflectors and pearl lamps of 100-watt and 150-watt, being used. The scheme is similar to that at Waterloo Tube Station, and described at one of our problem meetings last year.

The illumination on the stair-treads is 2 foot-candles.



FIG. 3.—The Lighting of an Escalator with Pedestal Indirect Units.

(C) *The Middle Landings.*—This space forms the connections between the two upper-level and two lower-level escalator tunnels; it consists of four arched bays with short connecting passages, and is 90 ft. long by 30 ft. wide. Indirect lighting is again employed: eight bronze and marble standards will be utilized, each containing one 200-watt and four 60-watt lamps; two standards (9 ft. high) will be erected in each bay. Temporary standards are at present in use for this work.

(D) *The Booking Hall.*—This hall, which lies about 15 ft. below street level, is an almost circular open space on one level, the diameters being 155 ft. and 144 ft., the height 9 ft.; the roof is carried on some 50 columns. The problem was to produce an effective lighting scheme



FIG. 4.—Method of Lighting Middle Landing by Indirect Pedestal Units.

which would meet with the approval of those concerned, and with this, of course, was coupled the architectural decorative scheme.

In order that experiments could be made for all requirements, a full-size model of a portion of the hall was constructed; on this various forms of lighting were tried; these included indirect lighting from the numerous columns, semi-direct lighting (also from the columns), cornice lighting, direct lighting with ceiling fittings and various forms of glassware; artificial daylight skylights in the ceiling, etc. Eventually the scheme of decoration with lighting as now installed,



FIG. 5.—Showing the Lighting of a Section of the Circular Booking Hall by Lamps in opal-glass cylinders attached to the columns.

designed by the consulting architect, was approved; this consists of a coffered ceiling of fibrous plaster, marble-faced walls, and 12-in. square floor tiles; the lighting is carried out by means of seventy-eight 150-watt pearl lamps, each concealed in an opal-glass cylinder having a slight taper; two of these are suspended from the bronze caps of 39 columns. The columns consist of bronze inlaid with red scagliola, and taper slightly inwards towards the base; these, of course, conceal the steel columns supporting the roof. For the area at the top of the escalators indirect lighting is again employed, the lamps being installed on the tops of the automatic ticket-issuing machines—the present machines will shortly be replaced with a new

type, and will consequently mean a modification of the present lighting arrangement, though the indirect method will still be employed.

The minimum illumination between the columns is 2 foot-candles.

(E) *Showcases*.—The showcases which flank the outer wall of the hall on the east, west and north sides are lighted with 60-watt lamps in angle reflectors at 12-in. centres. A special requirement for fire risk was to house these fittings in a separate wired-glass compartment.

Illumination about 14 foot-candles.

(F) *Subways to Street*.—There are five subways connecting the booking hall with the street; the lighting in this case is carried out with prismatic bulkhead fittings let in flush with the ceiling; this arrangement gives maximum head room, which in this case is a consideration of some importance.

The minimum illumination is 2 foot-candles.

In conclusion, it will be noted that various types of fittings and methods of lighting have been employed, each suitable for its particular location and requirement, and we consider the installation is a not unworthy feature of this great engineering achievement. The sensations of brightness and warmth are particularly noticeable, and, in accordance with our long-standing practice, the prevention of glare has been a first principle. The illumination provided is such that the public using the station and subways can pass quickly and freely about the premises, and are thus induced more frequently to travel Underground.

THE LIGHTING OF THE NEW HORTICULTURAL HALL, WESTMINSTER.

Mr. L. M. TYE, who was responsible for the next "problem," explained that the new hall which the Royal Horticultural Society had erected in Westminster had aroused a considerable amount of interest by reason of its spaciousness and originality of design. Work on this installation was commenced at the end of 1926 and completed in the summer of 1928. The site presented many difficulties, the first being that it was too small for the required floor space, and, secondly, that it was not rectangular. The question of floor space was solved by the formation of a dais annexe over the entrance hall, so that the entire ground area has been utilized for exhibition space, giving a total of 22,000 square feet.

The hall is 150 ft. in length by 124 ft. in width. The elliptical concrete arches have a span of 70 ft. and a height of 58 ft. The space they cover thus becomes a nave, and on either side are aisles 25 ft. wide by 24 ft. in height. The roof structure consists of stepped flats spanning from truss to truss and a series of vertical steel windows strengthened by mullions formed of steel channels and plates. The daylight intensity given by this great surface of glass is very high, thus conforming to outside conditions as far as possible.

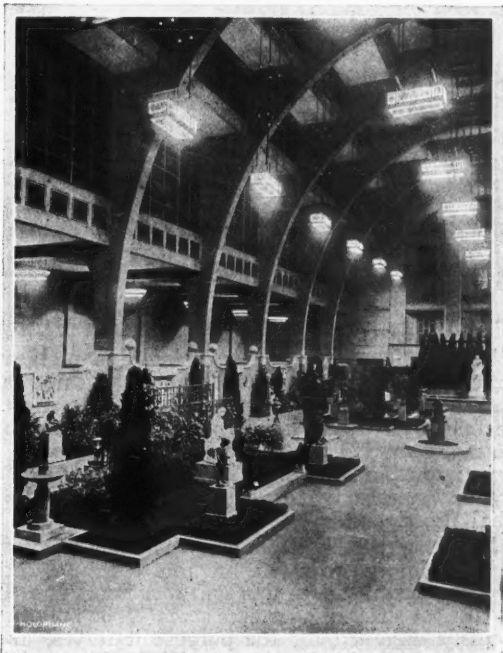
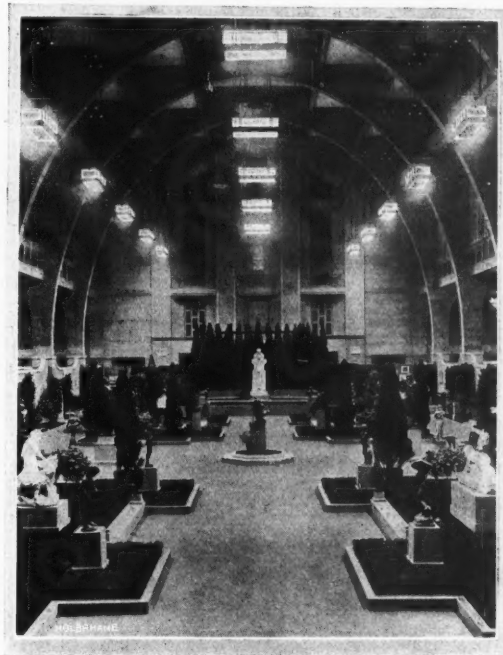
In regard to the provision of artificial lighting, the problems which the designers set themselves out to solve were the following: (1) Most suitable form of light distribution; (2) the elimination of visible "glare" from distant parts of the hall; (3) general efficiency; (4) fittings design.

(1). After considering the relative advantages of low mounting heights with wide light distribution and very high mounting with concentrated distribution, it was decided to adopt a mounting height of 36 ft. to 40 ft., which was the maximum height from which access could readily be obtained from a tower ladder.

(2). With the object of eliminating visibility from a distance, the possibility of using reflectors which restricted the light rays to the angle between the vertical and mid-span were considered.

Tests on these lines first of all revealed the difficulty in ensuring uniformity in horizontal illumination, and also how such methods restricted the lighting of vertical surfaces. As the outcome of these investigations it was found that for the mounting height contemplated a reflector giving the maximum light distribution from 0° to 15° , whilst maintaining a fair proportion of light

flux up to an angle of 40° , was the most satisfactory proposition. Tests to prove the soundness of this theory were conducted in the old hall between mirror types and prismatic. The latter were chosen because, apart from a proved increase in horizontal illumination efficiency, there was the further advantage that these types transmitted sufficient light in addition to illumi-



FIGS. 6 and 7.—Two Night Photographs illustrating the lighting of the new Royal Horticultural Hall, Westminster.

nate the upper parts of the building and without the need of auxiliary lighting, as would otherwise be necessary.

The final question to be solved, therefore, was the form which the fitting should take. It was, first of all, essential that this design had to be in keeping with the new style of architecture. This style dictated that the fitting should be rectangular in shape, and, to allow ample latitude in controlling the intensity of the lighting, each fitting was made to contain three reflector units.

The possibility of using entirely corrected artificial lighting was carefully considered, but was found to be impracticable to provide at a reasonable cost the illumination standard necessary. A compromise was therefore effected by introducing in the centre of each fitting a daylight-bulb lamp with a standard gasfilled lamp in the reflector on either side. The base of the fittings was also enclosed by a heat-resisting glass, lightly stippled.

The arrangement and equipment of the various fittings is as follows:—

Down the centre of the nave are placed six fittings suspended from the elliptical arches arranged transversely at a height of 40 ft.

To the left and right of this centre row are placed 14 similar fittings, suspended from the trusses and running parallel with the side walls at a height of 36 ft.

The fittings in the side aisles, whilst accommodating similar reflector units, have been modified in design for fixing close up to the concrete beams at a height of 24 ft.

500-watt daylight lamps are used in conjunction with the centre reflector in each fitting. The remaining two lamps in each fitting are 300-watt ordinary gasfilled type, with the exception of the centre row of six fittings in the nave, which have 500-watt lamps. The distance between the fittings in a longitudinal direction is approximately 22 ft., and the space between the two outer rows of nave fittings 42 ft., with the six transverse fittings interspersed between them.

The illumination intensities recorded in the main hall were as follows: Centre of hall, 8 foot-candles; end of hall, 7 foot-candles; side aisles, 8 foot-candles.

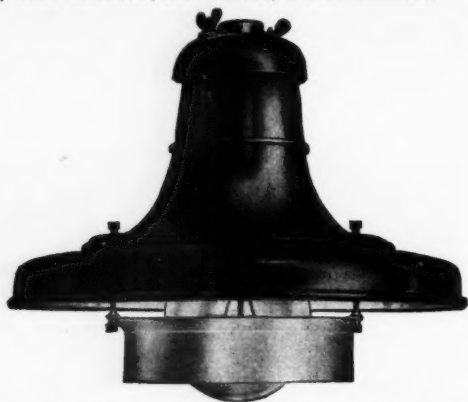


Fig. 8.—A View of the Lighting Unit adopted for the new Carreras Factory.

THE LIGHTING OF THE NEW CARRERAS FACTORY.

Mr. G. HERBERT, in introducing this problem, remarked that the lighting installation in this new factory illustrated in Figs. 9-11 was a very complete and extensive one, over 1,000 lighting units being employed.* One really needed to see the factory in order to get a proper impression picture of its appearance, which could only be imperfectly conveyed by lantern slides and verbal description.

Mr. Herbert then explained that the factory is a modern reinforced-concrete fireproof building, comprising a basement ground floor and four floors above, with a total floor space of over nine acres. The building was expressly designed for the purpose it serves, and the lighting installation has been studied with special care. Excellent conditions have been obtained, the lighting being very easily controlled and maintained, and, in fact, forming a piece of work in which the engineer in charge can take legitimate pride.

The wiring arrangements deserve some notice. When the building was ready for the introduction of fittings special provisions were already made. In the centre of each bay a junction box was cast into the concrete flush with the ceiling, and a length of conduit screwed into the top and again connected with another two, three or four way junction box, resting on the concrete of the

floor above. This enabled the wireman to connect the service conduit and draw in the cable leads with a minimum amount of labour. Provision was also made for the floor-board over each junction box to be removable.

A connector enables any individual fitting to be easily taken down for cleaning and maintenance, and each fitting is definitely earthed through the continuity of the whole system.

In order to illustrate the lay-out of the building, Mr. Herbert showed a plan of the fourth floor, occupying about 58,000 square feet, bays being approximately



Fig. 9.—Typical View illustrating the lighting of the new Carreras Factory.

17 or 18 feet square. The height from floor to ceiling was 15 ft., and the working plane was taken to be 3 ft. above the floor. Owing to the reinforced beams being 12 in. below the ceiling, fittings were mounted roughly 9 ft. above the working plane.

An illumination, free from glare and of an intensity of not less than 6 foot-candles, was proposed. Generally speaking, the conditions were ideal from the standpoint of diffusion of light, walls and ceilings being all newly finished in light colours. 300-watt gasfilled lamps, spaced at intervals of 17 to 18 ft., were adopted.

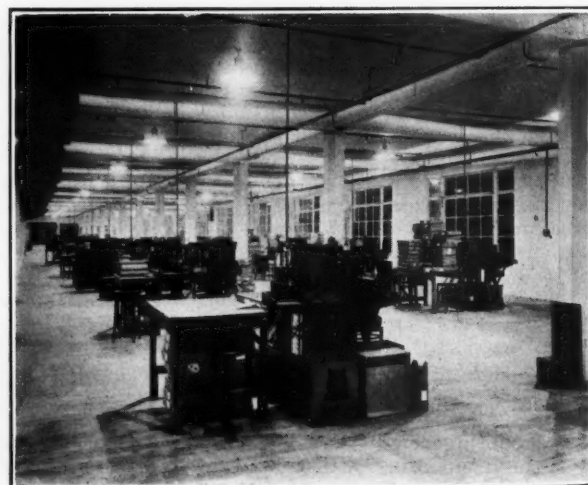


Fig. 10.—Another View showing the good diffusion of light.

The next point was the choice of the lighting units. In view of the spacing of approximately 1:1 being already specified, concentrating reflectors would not be suitable in this case; nor would reflectors of the standard industrial type be quite satisfactory, as there would be too great a fall in intensity between the units. Distributing-type reflectors were next suggested and were experimented with, but it was thought that the lamps would be too visible. The only form of fitting which seemed to answer requirements completely was that illustrated in Fig. 8, which is a 16-in. reflector, is

* We regret that, owing to a clerical error, this number was inadvertently given as 100 in our last issue.



FIG. 11.—Another Section of the Carreras Factory. Lighting Units are out of the direct range of vision, and there is a clear view of the whole interior.

equipped with a bowl-frosted 300-watt lamp, and is furnished with an anti-glare rim.

Fittings of this type are shown in operation in the night photographs here reproduced (see Figs. 9-11), which were taken exclusively by the light of the fittings shown, and were absolutely untouched. The average illumination throughout the building is 7 foot-candles, and a feature is the soft and restful effect and the absence of glare. The lighting load amounts to more than 330 kw.

ATMOSPHERIC LIGHTING OF THE AUDITORIUM OF THE MAJESTIC THEATRE AND KINEMA, WEMBLEY.

Mr. R. A. IVES'S contribution deals with another interesting kinema installation, i.e., in the Majestic Theatre and Kinema, which incorporates a café and ball-room, with accommodation for 500 dancers; the auditorium will seat 2,000 persons.

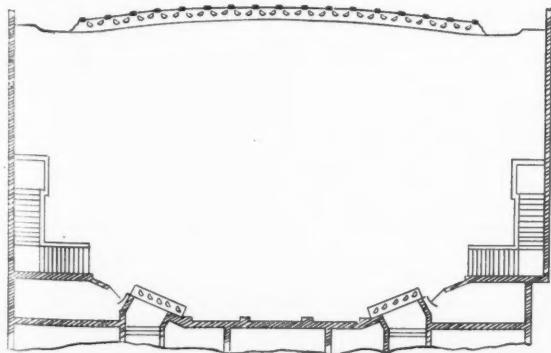


FIG. 12.—A Plan of the Auditorium of the Majestic Theatre, Wembley

The decorative scheme from the loggia to the crush hall, then on to the foyer, Mr. Ives remarked, is such as to convey the sensation of meeting fresh aspects of decorative beauty, until finally one is in the glowing warmth of the auditorium atmospheric impression of a sun-bathed Italian garden. The walls of the auditorium present a wealth of foliage and beauty of architectural and decorative detail, characteristic of an Italian gardenscape at its best.

A suitable lighting installation for the auditorium presented a special problem. It has been designed to assist the atmospheric character of the decorative scheme and furnishes a well-diffused illumination, giving the effect of sunshine in an Italian garden. How this was effected is briefly described below:—

Lighting Equipment.—An installation of 50 floodlights, giving a total light flux of 117,200 lumens, has been installed for the lighting of the auditorium. The location of these units is shown diagrammatically in Fig. 12, which is a plan of the auditorium, and in Fig. 13, which is a sectional elevation drawing.

A special housing is provided at the front of the balcony; in this 32 floodlights are installed, equipped with twenty 250-watt projector lamps and twelve 100-watt projector lamps. At the back of the balcony 10 floodlights are arranged, five at each side, equipped with



FIG. 14.—One of the Floodlights used in this installation.

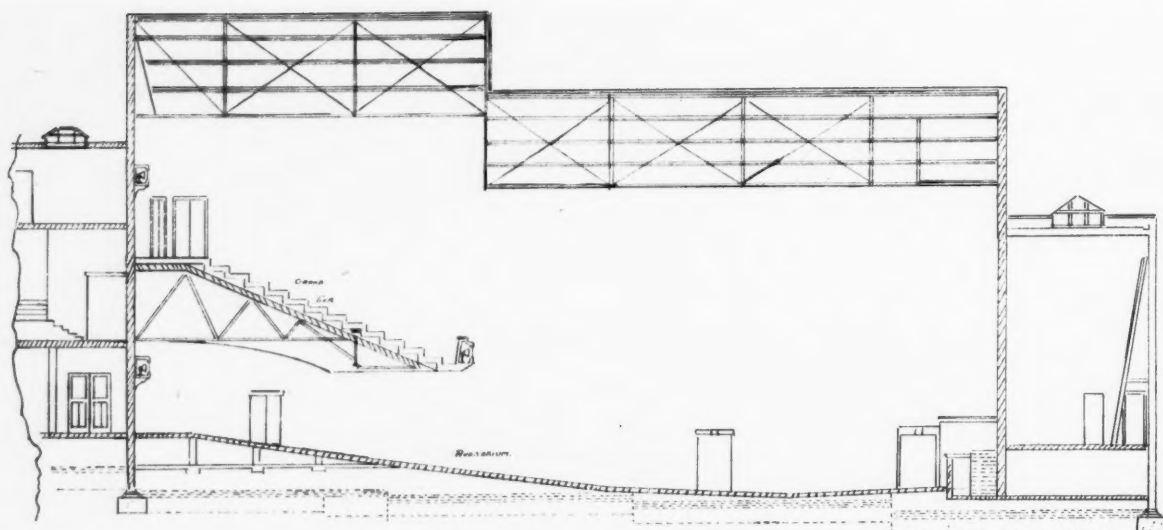


FIG. 13.—Sectional Elevation of Auditorium in the Majestic Theatre, Wembley.

250-watt projector lamps. Under the balcony eight floodlights are arranged, four at each side, equipped with 250-watt projector lamps, thus making a total load of 10.7 kw.

The front of the balcony is divided into 16 sections, each section being glazed with special diffusing-glass panels, which have floral designs painted on the front to camouflage any defined beam images. Two floodlights, each equipped with amber glass fronts, are housed in each section; the optical alignment of the projectors being such that the beams cross and are projected on to the walls, ceiling and proscenium of the auditorium. The resulting illumination obtained gives the effect of warm sunlight in the Italian garden scene, and there is an entire absence of any defined directional beams from the projectors. The twenty 250-watt projector lamps are grouped in the 10 central sections and the twelve 100-watt projector lamps are placed in the three sections at each end of the balcony nearest the walls. It was originally planned that the projectors should give a direct projection to each wall without crossing the beams, but owing to the limited space available, and also in view of the limitation of the line of vision from below the balcony to the stage, the scheme was modified in accordance with that described.

At the back of the balcony the floodlights are housed behind diffusing-glass panels, and are camouflaged with floral designs; the beams being projected on to the

opposite walls and the ceiling. A similar scheme was adopted under the balcony.

Electrical Control of Lighting.—The lighting load is equally balanced on three phases and controlled by three dimmers. By this arrangement the effect of changing gradually from night to warm sunshine is obtained, and back again to night with the stars shining in the sky; the star effect is obtained by placing lamps behind small apertures in the roof, the illusion being quite realistic.

Fig. 14 shows an illustration of the floodlight used. Fig. 15 shows a photographic view of the balcony. Fig. 16 shows a photographic view of the auditorium wall. Fig. 17 shows a view of the café, with special lighting fittings.

Pilot Lights.—Small low-wattage amber-coloured pilot lights in Arabian lanterns are spaced at intervals in the auditorium; these harmonize with the scheme of decoration, but do not affect the general illumination in any way. Ample light is reflected into the auditorium from the surrounding walls to give adequate illumination for the audience to read their programmes in comfort.

Mr. Ives concluded by remarking that, from the brief description given, it would be realized that the lighting was an indirect system of illumination with the light sources concealed as far as it was physically possible, and the results obtained were considered very pleasing and effective. It also opened up another field in flood-

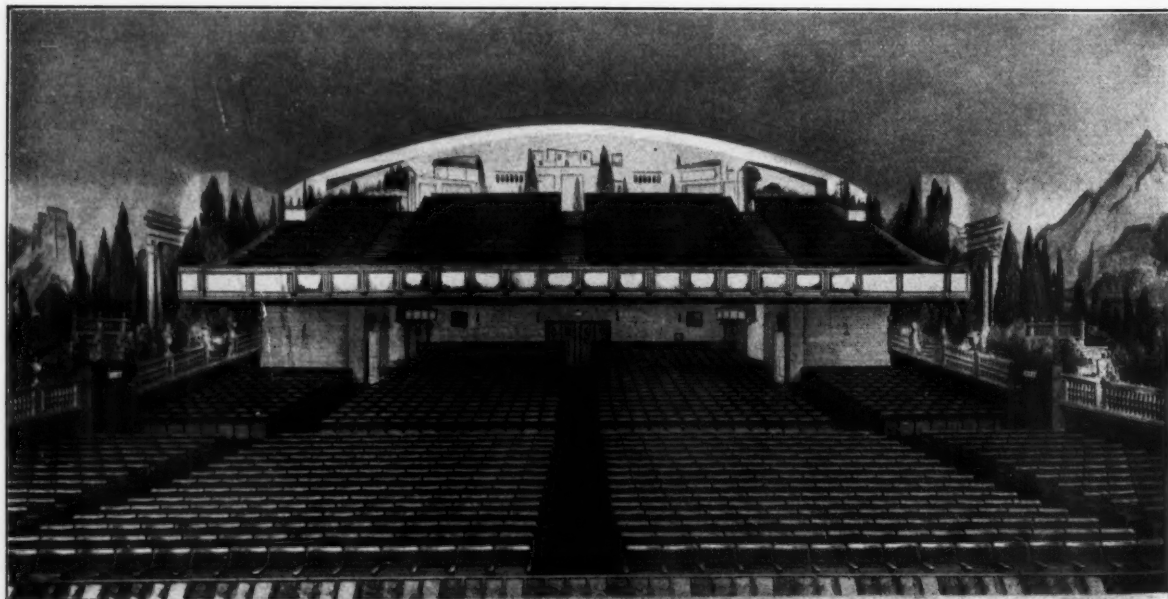


FIG. 15.—A Pleasing View, showing the Balcony.

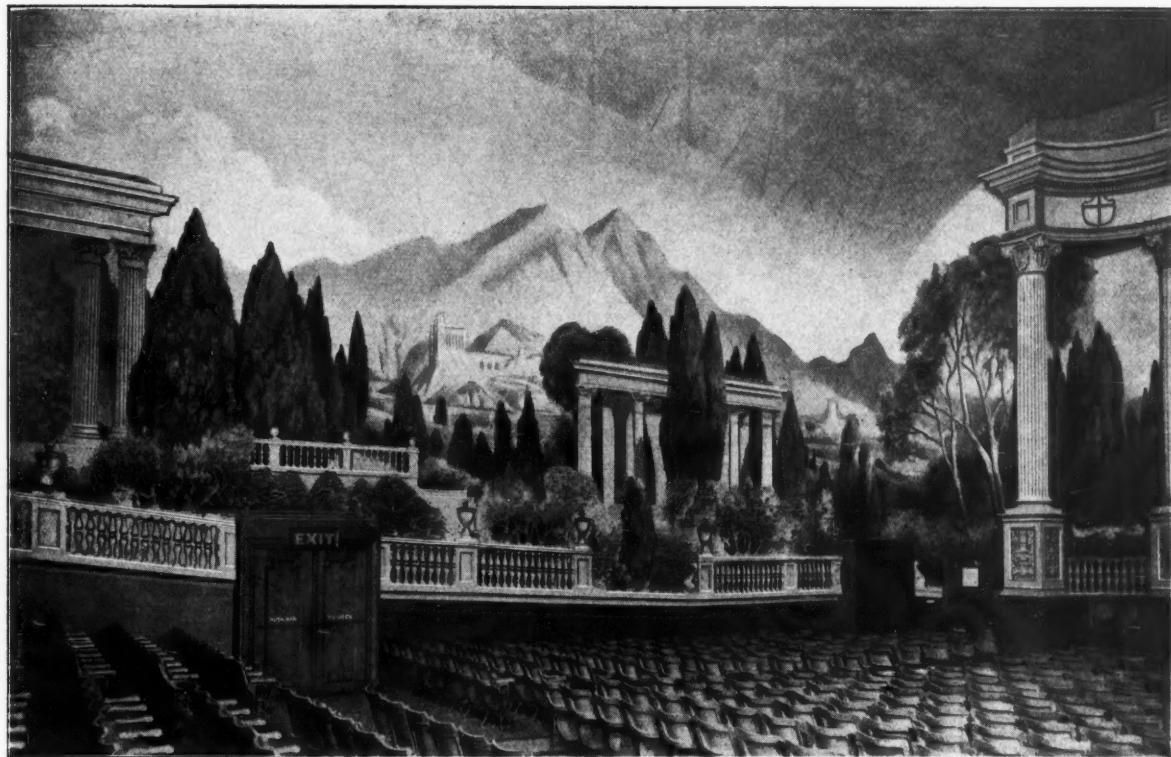


FIG. 16.—Showing a Photographic View of the Auditorium Wall.

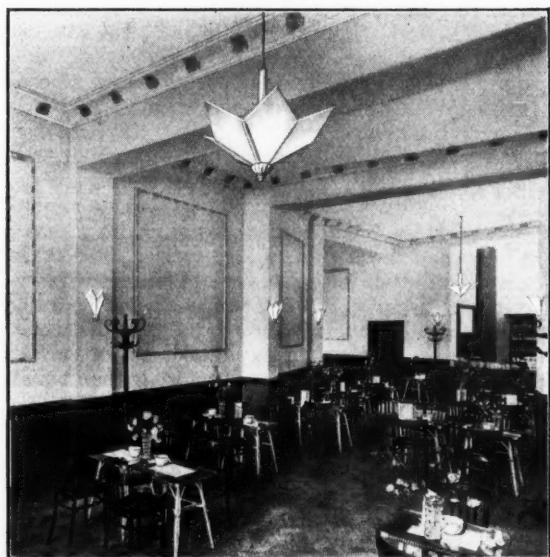


FIG. 17.—A View of the Café, showing the Special Lighting Fittings.



FIG. 18.—Showing Special Lighting Fittings in use in the Ballroom.

lighting with many possibilities for future interesting developments.

Mr. Ives also illustrated his remarks by several lantern slides photographed by a colour process, an enterprising experiment which helped to give an idea of the charm of the lighting effects and wall decorations, though admittedly even this process did not completely convey the actual impression produced by the colours.

THE ARTIFICIAL LIGHTING OF THE COVERED LAWN TENNIS COURTS AT THE QUEEN'S CLUB.

In the absence of Mr. G. F. Allom, this problem was dealt with by Mr. J. S. Dow, who recalled a discussion which had taken place on the subject before the Society which he had opened some years ago.*

The lighting of covered lawn tennis courts was a particularly difficult problem, and the lighting had to answer more than ordinary requirements owing to the speed with which the ball travelled and the vigilance that had to be exercised by players. The problem had been dealt with at the Queen's Club in an ingenious manner by Mr. G. F. Allom. Mr. Allom was unfortunately prevented from being present, but had furnished him (Mr. Dow) with a brief description of the installation.

Mr. Allom considered that the two main requirements were:—

(1) A sufficiency of illumination, which should be from 12 to 20 foot-candles at a level of 4 ft. above the court surface, with the higher value down the centre of the court, where, in general, the swiftest balls pass. There should be no sudden diminution in illumination, and the illumination should only diminish gradually as one approaches the side lines.

(2) There should be no glare when players are facing the net, nor when they are looking upwards for purposes of serving or "smashing."

The method of satisfying these requirements was a relatively simple one. Fourteen to sixteen lighting units are suspended in one line down the centre of the court, at a height of about 32 ft. from the floor. These fittings are designed to throw an oval beam of light, the cross-section of which is indicated on the accompanying plan (see Fig. 20). These beams are so directed as to overlap each other, all throwing slightly towards the net,

* *The Illuminating Engineer*, June, 1921, pp. 149-162.

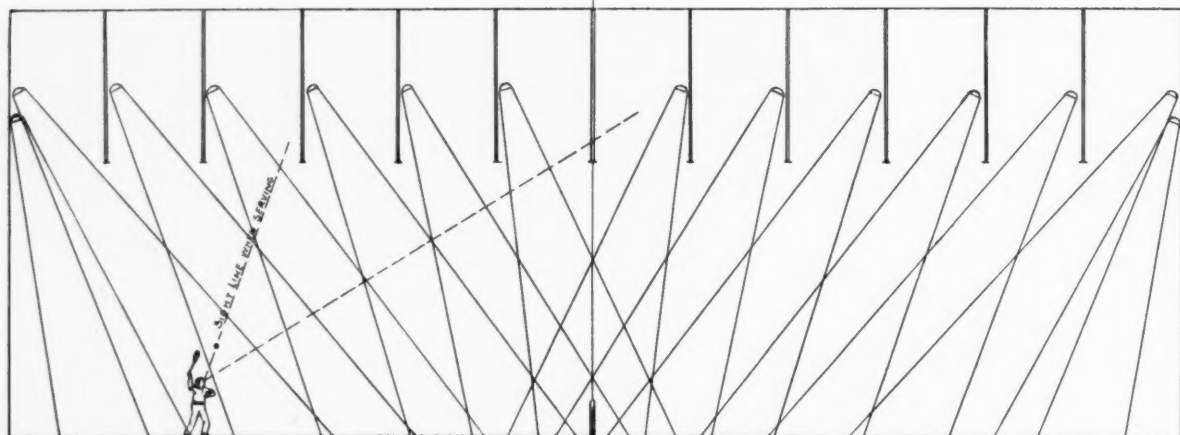


FIG. 19.—Illustrating the principle of Overlapping Beams from Overhead Units, so arranged that there is no glare in the eyes of a player when looking upwards or towards the net.

and the beam is sufficiently confined to prevent a fitting over the player's head causing glare when he looks upwards. (See Fig. 19.) A feature is the special "cut-off" given to the reflector, direct light being screened

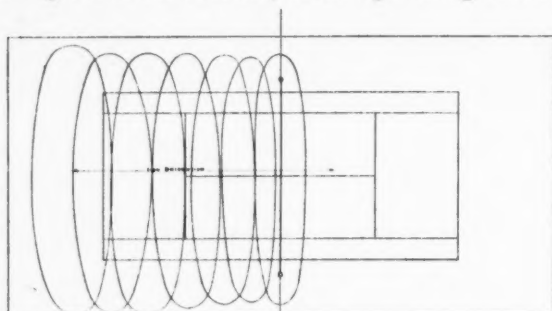


FIG. 20.—Showing Elliptical Section of Beams of Light, which overlap.

so that the filament is invisible to players from the opposite side of the net.

In presenting these illustrations Mr. Dow briefly discussed various features of the lighting. He pointed out that a player just behind the net *might* get a glimpse of the light from the unit nearest to him when looking upwards. This possibility was difficult to exclude completely, but in good tennis a player at the net could rarely be looking directly upwards in this way, for a ball falling just behind the net would present a very easy "kill" indeed.

A second point that might be raised was that the system involved separate beams of light which did not overlap in the high region near the reflectors. Hence it might be suggested that a ball would pass into a dark zone and become temporarily invisible. In actual fact, however, this did not arise, because balls travelling at this height were rare and would either be going outside the court or in danger of striking the roof and thus becoming "dead."

Mr. Dow added that, according to the information given by Mr. Allom, 18 foot-candles could be obtained down the centre line and 15 foot-candles down the side lines, with a consumption of about 8 kw.

Discussion

The PRESIDENT, in opening the discussion, said that the contribution had been most varied and interesting. He inquired what percentage of the light used in the Horticultural Hall was daylight-corrected.

Mr. E. STROUD said that the proportion was about 25 per cent. It was impracticable to adopt complete artificial daylight in this case, as the consumption and expenditure had to be kept within limits.

Mr. F. C. RAPHAEL and other speakers said that they had found some difficulty in obtaining precise figures for the amount of light absorbed by daylight lamps. In such cases it was essential that lamps should not be underrun, otherwise the blue and violet element in the light was diminished and the absorption of light by daylight bulbs increased. Aging of lamps during life would have a similar effect.

Mr. L. E. BUCKELL stated that one explanation for variation in the absorption of light by daylight lamps was the fact that the thickness of the bulbs necessarily varied. This variation was of small moment with clear-bulb lamps but was important when daylight lamps were used. The absorption naturally varied according to the degree of colour correction aimed at. At present there were two main types of bulbs, "daylight blue" and "sign blue," absorbing respectively about 50 and 25 to 40 per cent. The effect of overrunning no doubt existed, but was, he thought, less than might be expected. He did not think that aging during the life of a lamp had a very material influence, and the progressive diminution in light was not very much greater than in the case of clear-bulb lamps. In the new building of Imperial Chemical Industries Ltd. the whole of the lighting was done with daylight lamps of the "sign blue" type, carefully selected to give the minimum absorption of light.

Mr. F. L. CALVERT remarked that the various trades interested in appearance of colours seemed to have different standards of requirements. It would be a great advantage if a universal standard of artificial daylight could be arrived at by consulting leading trade organizations interested, such as those concerned with dyeing, colour-calico printing and glass.

Mr. G. HERBERT condemned the practice of using lamps intended for higher voltages than that of the actual supply as unsound. In the great majority of cases the cost of the lamp was small in comparison with the cost of energy, and it paid to use the lamp under the most efficient conditions. In the case of daylight-corrected lamps this question seemed to be of special importance.

This point was also discussed by other speakers, who suggested that an effort should be made to get some more exact data on the absorption of daylight lamps and the effect of age and underrunning.

A cordial vote of thanks to the various authors terminated the proceedings, after which the PRESIDENT announced that the next meeting would be held in the lecture theatre of the E.L.M.A. Lighting Service Bureau on March 19th, when a paper on "Architectural Lighting" would be read by Mr. Waldo Maitland.

Architectural Lighting

By WALDO MAITLAND, Architect

(E.L.M.A. Lighting Service Bureau).

(Paper presented at the Meeting of the Illuminating Engineering Society, held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C., at 6-30 p.m. on Tuesday, March 19th, 1929.)

PERHAPS at the outset of this paper I should endeavour to define what is meant by architectural lighting, since, in many quarters, there undoubtedly exists some confusion as to the exact meaning of the term. Of necessity all lighting is architecturally important, but this new development aims at making lighting a more prominent element in the design of buildings, so that the artificial lighting becomes an essential part of the architectural decoration, and, in some instances, with which I propose to deal later, it becomes definitely a major element.

The chief characteristic of this mode of lighting is the fact that it is built into the fabric of the building, and forms an integral part of the architecture.

I propose in this paper to consider this subject in some of its phases, and hope to suggest lines of development, and to show how important, in designing, the element of artificial lighting can become.

The resultant effect which is being obtained by artificial lighting is receiving greater attention in its application to public, commercial and domestic buildings. Due consideration is given to the proper clothing of the light source and its correct position in relation to the general scheme of decoration; this last being of vital importance of architectural lighting.

In the past, before the introduction of modern light sources, it was found necessary to place the lighting element at a fairly low position in the room, on account of the poor light obtained from the illuminants then available, but as more recent light sources were developed, and the convenience afforded by electric sources became apparent, greater freedom became possible in the design of illumination schemes for a given purpose. To-day, with the modern gasfilled lamp, available in small and large sizes, one is able to place the lighting unit at any desired position, and take advantage of this fact to design the lighting as part of the fabric, imparting important character to the room and influencing its form to a certain degree.

Isolated examples of built-in lighting, such as cornice lighting or illumination from skylights, have been designed during the last 10 to 15 years, but it was not until comparatively recently that this movement received general stimulus subsequent to the Paris Exhibition in 1925 from which the basis of architectural lighting, as we know it at the present day, took form.

As a general rule, the illuminating engineer is chiefly concerned with the resultant illumination in terms of foot-candles obtained on the working plane, but the applications of lighting to domestic and public interiors require something more, namely, that the light should be so distributed that the walls and ceilings give desirable brightness contrasts, thereby imparting form, decoration and colour to the interior. It is, of course, necessary in architectural lighting to have a good basic light, that is, an "all over" light of sufficient intensity, after which all other lighting effects may be built up. The amount of the "basic light" will obviously vary in intensity according to the function of the room or the degree of visibility required. This is somewhat similar to the requirements of the photographer, who requires a certain standard of lighting to illuminate his subject, and who then proceeds to build up the high lights by directional lighting.

Simplicity is the keynote of modern architecture and decoration, relying largely for its effect on form, colour and texture of material, with marked restraint in the application of detail. Paul Follot well describes the aim of the modern movement in writing of the domestic interiors recently exhibited at Messrs. Waring & Gillow. He says: "The architecture is plain with very little relief or moulding, suppressing the well-known dust traps. The windows are large, with as much glass as

possible in order that sunlight can overflow into the house, bringing health and happiness," and a little later in the same article "incandescent parts of the electric lights are carefully hidden, the luminous power being used to its maximum potentiality by diffusion, or used in the best artistic way with the help of reflection or refraction."

Architectural lighting, incorporating the lighting units in the structure of the building, may be obtained from:—

- (a) Panels in the ceiling.
- (b) Panels in walls.
- (c) Lighted columns.
- (d) Lighted lintels.
- (e) Cornice lighting.

In some instances, the lighting effects are obtained by reflection from opaque surfaces, i.e., indirect lighting, while in other instances the light is obtained through translucent material, providing either semi-indirect or a direct form of illumination. In the former, the effect is achieved by reflection from white or coloured surfaces, while in the latter the quality and colour of the translucent material is important. The indirect method, however, inevitably suffers from the lack of vitality associated with this form of lighting, and in general, when employed, requires supplementary lighting methods to give complete satisfaction. It may be possible at some time in the future to recommend a relation between the area and brightness of indirectly lighted surfaces and the area and brightness of luminous surfaces within the field of view, and so obtain a balanced architectural effect.

There is one important feature of these architectural methods of lighting which considerably assists the furtherance of good lighting, namely, that high intensities of illumination can be provided from light sources within the field of view which are of comparatively low brightness, and, in the best examples, any semblance of glare is avoided.

Another phase in architectural lighting is the use of light to modify the conception of space, and to give a sense of separation between one room and another: for example, by lighting the surfaces within the field of view in one room to a greater brightness than those in the adjoining room. Of course, a similar result is frequently obtained by the careful choice of colour schemes in adjoining rooms. An excellent example of this effect of separation produced by coloured lighting is to be seen at the Mayfair Hotel in a reception room and adjoining ballroom.

Architectural lighting is as yet in a very early stage of development, and some of the examples which I propose discussing only incorporate a little of this architectural lighting effect; in others the lighted or luminous surfaces play a vital rôle in the character of the interior or exterior design of the building.

INTERIOR LIGHTING.

Lighted Capitals.—An interesting effect has been obtained in some instances by lighting the caps of columns, and this method may be applied to provide general lighting in the interior when the columns are sufficiently close together. To be at all successful from an architectural point of view, the columns themselves have to be very carefully designed.

Such a method of lighting has been introduced in the Accounts Section of the Shoreditch Electricity Showrooms, where lamps are introduced in the glassware at the capitals of the columns. A similar method is employed in the second class dining saloon on the French liner "Ile de France." In this instance, however, the glassware capping the columns almost abuts the ceiling.

Another interesting example of the same character is that of the splayed fillets of glass on the square columns in Wertheim's Store in Berlin. In this case, the amount of general lighting provided in this way is comparatively small, since this feature only aims at providing an architectural lighting decoration.

The lighting decorations need not necessarily be important from an illumination point of view, but may nevertheless be a valuable element in the architectural design; in such cases, however, adequate illumination must be provided from auxiliary sources.

Other English examples of a similar character are found in Lyons Corner House in Oxford Street (see Fig. 1) and in a reception room at the Savoy Hotel.



FIG. 1. Lyons Corner House. The Lighted Caps to the Columns in Restaurant.

Lighted Columns.—The illuminated columns on the ground floor of the main Berlin Electricity Showrooms form an interesting feature at the head of the stairway leading to the floor below. Although the columns are luminous their position does not suggest that they are intended for supporting loads, and hence, contrary to many examples of lighted columns, they do not convey the appearance of weakness. Wide metal bands form capitals to the columns and these in turn are supported by subsidiary vertical and horizontal strips. Auxiliary lighting is provided from the upper portion of the frieze and the cornices, giving a general even brightness to the ceiling.

In other examples, columns are built up from units of moulded lighting glassware on either side of doorways. This is a feature which can be incorporated when the main fabric of the building is completed.

COMPLETE ARCHITECTURAL LIGHTING SCHEMES.

In the following examples the lighting has become an integral part of the architectural design, and it is evident that the modelling of the room has been influenced by consideration of architectural lighting.

For instance, in the first class dining saloon on the "Ile de France" direct lighting is provided from the ceiling by 164 symmetrically arranged portholes, each housing a 300-watt lamp and covered with thick yellow-tinted glass. The strong lines of the room are not in any way hindered by the lighting system, but are, if anything, emphasized by the repetition of the lighting units, which are well placed in the ceiling and walls. The electrical consumption is $5\frac{1}{2}$ watts per square foot, and the lighting effect is that of brilliant sunlight.

In the first class lounge on the same liner, the central portion of the ceiling is composed of squares, egg-shaped in section, and a lamp is placed at the apex of each. An interesting effect has been produced in this room by the introduction of a light fawn carpet below this central

part of the ceiling. The furniture, too, is light in colour, so that, when brightly lighted from the ceiling, this portion of the room stands out in contrast to the surrounding carpet and furniture, which is carried out in dark browns and greens. Indirect cornice lighting illuminates the remaining parts of the ceiling, which, since it is textured, gives a rich decorative effect.

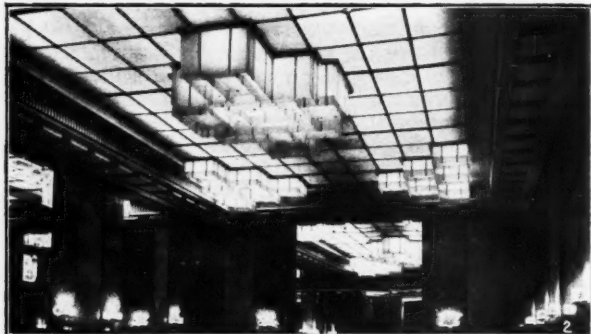


FIG. 2.—A Lighted Ceiling in a Restaurant, Lyons, France.

Fig. 2 shows the ceiling of a restaurant at Lyons, France, which primarily consists of a skylight fitted with obscured glass and lighted from above. Suspended from this are large lighting units built up of sheets of obscured glass, and arranged to be in harmony with the shape of the room. The vertical strips of glass are attached to supporting rods which also retain the horizontal sheets. The whole interior is very successful, and the effect is emphasized by the introduction of a large mirror at the end of the room.

The following examples refer to the lighting of Continental bars, but similar examples exist in this country:—

The Bar Bergere in Paris (shown in Fig. 3) is an interesting example of interior lighting where the columns, ceilings, and counter are rendered luminous. The luminous surfaces assist in giving an atmosphere of gaiety.

In another instance the main illumination is obtained from a recessed ceiling, the lamps being housed in coves, a warm and pleasing effect being obtained by the introduction of coloured lamps on various circuits.

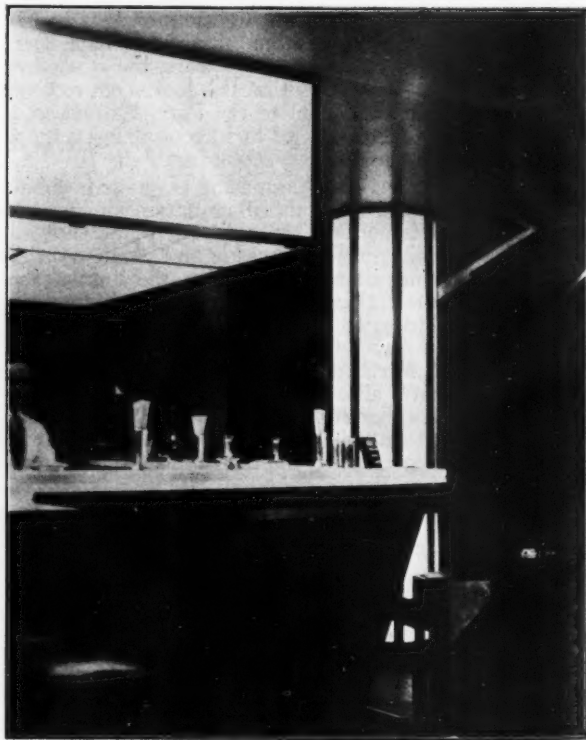


FIG. 3.—Bar Bergere, Paris. Luminous Counter Columns and Ceiling.

The next example shows the new Franco-Brazilian Coffee Bar in Paris, which is constructed in the form of a kiosk. It is almost entirely illuminated by indirect lighting provided from eight 150-watt gasfilled lamps in a central reflector which lights up the curved ceiling. A diagram of the lighting arrangement is shown in Fig. 4, and it is important to bear in mind that, when the shape of such a dome is skilfully designed, each portion of the ceiling will appear uniformly bright.

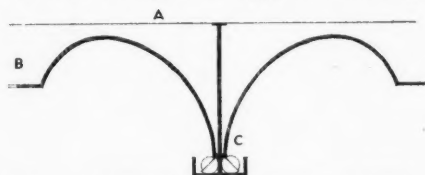


FIG. 4.—Bar Brazilian, Paris. Section of Ceiling.

Where difficulty is experienced in obtaining reasonably uniform brightness of certain curved surfaces, it may be necessary to grade the surface from a dark tone near the light source to a light tone at a distance.

The lighting of the Bar Chiquito, Paris, shows other interesting architectural lighting features. It is lighted by a luminous ceiling which is framed by a strong luminous band obtained from lamps placed in reflectors housed above the broad dark frame of the ceiling. A large ovolo moulding, containing lamps at the base of the ceiling, lights up the lower portion of the textured sides, and the gradation of brightness on the textured portion emphasizes the lines on sloping sides.

In the entrance lobby of the same bar (see Fig. 5) an unusual feature is provided by luminous beams consisting of large sheets of diffusing glass with a number of small lamps behind. Incidentally, the fish tank is placed close to one portion of the beam and the fish are thus lighted up.

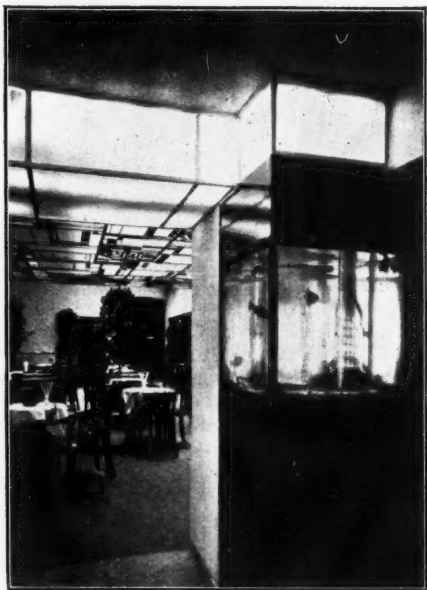


FIG. 5.—Bar Chiquito, Paris.

These illustrations show the infinite possibilities in the use of artificial light as a means of decoration and the creation of atmosphere.

DOMESTIC INTERIORS.

Similar lighting methods can be applied to domestic interiors, and some excellent examples of modern domestic lighting were to be seen in the exhibition rooms at Waring & Gillows' recent Modern Art Exhibition.

Fig. 6 shows the modern lighting arrangements for the study in a Paris flat. The interior is lighted from four diffusing glass panels let into the frieze, behind

which mirrored reflectors are installed to direct the light through the diffusing glass towards the ceiling.

In all examples of architectural lighting better results are achieved when the "architectural lighting" is supplemented by lighting details such as applied fittings,



FIG. 6.—Small Study in a Paris Flat.

and further reference will be made to this at a later stage in this paper.

ARCHITECTURAL LIGHTING FOR EXTERIORS.

I have, up to now, been dealing with purely architectural lighting as applied to interiors, but if logical methods of applications are evolved there is no reason why the lighting of building exteriors should not become a natural thing in the future. Already many daring attempts have been made with remarkable success. While the daylight appearance of an interior is important (although there are many instances where the interior is essentially designed for artificial lighting), this question becomes of still greater importance when considering exterior design, and the best schemes are those which serve the dual purpose. Many examples of architectural lighting applied to shop fronts have already made their appearance in Germany and France, and to some extent in this country, and the following examples show that electric lighting can play an important part in the general effect of the front.

While the main consideration, from a commercial point of view, is obviously that of giving a shop front added power of attraction, there is no reason why the architect cannot obtain both commercial attractiveness and architectural soundness by careful arrangement of lighted surfaces on the façade. In some instances, selected surfaces of the building may be lighted up from lamps concealed on the face of the building, and in others luminous surfaces may be provided by lamps behind translucent materials, such as opal or frosted glass. The character of the ordinary shop front only remains visible as long as daylight lasts, but as soon as night comes its identity vanishes, and it is in maintaining this identity at all times that architectural lighting can be successfully employed.

When lighted glassware is employed on a façade, it should be discreetly handled so as not to directly interfere with the apparent stability of the structure; in some instances grave errors have been made in this direction which have resulted in a decided weakness in design.

Exterior architectural lighting can be obtained by illuminating horizontal bands, the façade of the building being provided with white horizontal surfaces, each provided with a cornice to accommodate lamps on the upper side. The daylight architectural lines of the building are thus emphasized at night time and the appearance is as effective by day as by night.

Other façades of a different character are almost entirely composed of glass, and yet, in spite of this fact, the designs do not suggest that the glass is supporting the building. The interplay of vertical and horizontal lines can be made to give the design an interesting character, the lettering on the frieze being both decorative and valuable from an advertising point of view. I feel that in architectural lighting designs, as applied to shop exteriors, all signs should form an integral part of the façade.

Galleries Lafayette, Paris. This represents a well-known example of marquee lighting, and is interesting from its magnitude and commercial value. The marquee, which is 500 feet long, consists of a strong metallic frame to carry the glass, in the structural design of which great care was taken to permit easy access to lamps. The construction of such a large marquee presented a difficult problem. Most of the glass in the marquee is ribbed on one face, and designs are made by cutting these ribs in certain parts. Some portions of the glass are left clear, while others are rendered diffusing by sand-blasting or acid-etching, all of which gives variety and relief to the material. The marquee itself requires 800 lamps of 500 watts each, while the outer edge, which defines its shapes, uses 1,500 lamps of 500 watts each.



FIG. 7.—Selfridge's Canopy. Day view.

There are in all 2,600 lamps, totalling 625 kilowatts, and when it is borne in mind that the lighting circuits are arranged to give blending of colour it will be readily appreciated that the marquee appears at night time as a colossal jewel. The new canopy of Messrs. Selfridges is perhaps one of the best examples in this country of decorative exterior lighting of this kind. Day and night views are shown in Figs. 7 and 8.

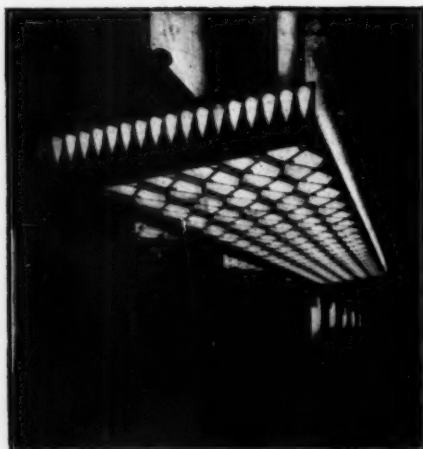


FIG. 8.—Selfridge's Canopy. Night view.

The Lotus Shoe Company in this country have recently embarked on a rebuilding programme, incor-

porating architectural façades to the shops of some of their more important agents, and that in Edinburgh (shown in Fig. 9) is of special interest. The windows

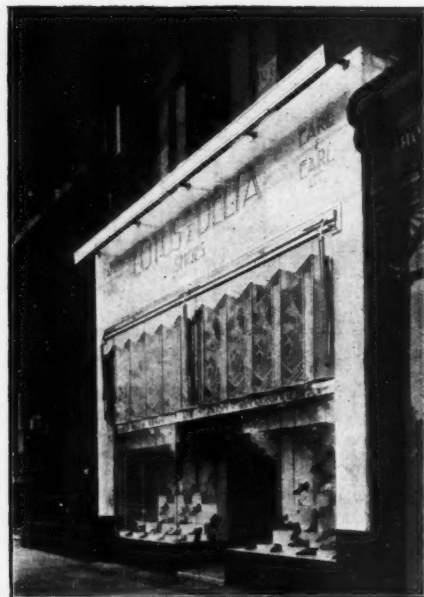


FIG. 9.—Lotus Shoe Co., Edinburgh. Day view.

are lighted from reflectors placed above vertically hanging sheets of glass, and immediately above them a valance, consisting of decorative glass, is lighted by a number of small lamps, while, of equal importance, the lighting arrangement for the fascia is neatly designed. The following represent the details of the lighting of the shop front:—

LIGHTED SHOP FRONT OF MESSRS. EARL & EARL LTD.,
EDINBURGH.

| Window. | No. of Lamps. | Size—Watts. | Total Watts. |
|----------------------------------|---------------|-------------|--------------|
| Above Transome ... | 21 | 40 | 840 |
| Entrance Lobby Soffit ... | 23 | 40 | 920 |
| Lighting Trough for Facia ... | 20 | 100 | 2,000 |
| Shop Windows ... | 64 | 60 | 3,840 |
| Total ... | 128 | Total ... | 7,600 |

The next illustrations (Figs. 10 and 11) show day and night views of Galleries Lafayette in London, which is one of the most interesting examples of a well thought-out lighting scheme. The whole has the effect of a stage, the surrounds being left dark, fulfilling the function of a proscenium arch. A feature which has great significance in the design of this front is that all lighting surfaces are placed at right angles to the façade, not in any way destroying the effect of stability, which is lacking in many other examples. Stencilled lettering on the frieze is attractive and has essential advertising value, and the daylight appearance, as well as the night



FIG. 10.—Galleries, Lafayette, Regent Street, London. Day view.

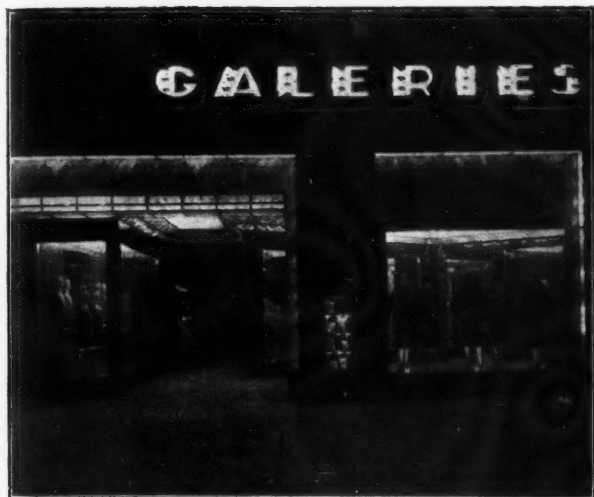


FIG. 11.—Galleries, Lafayette, Regent Street, London. Night view.

one, is very satisfactory. The translucent material which has been used consists of sand-blasted designs on plate glass, but unfortunately the effect of the design is lost due to the poor placing of lamps, which fail to synchronize with the design.

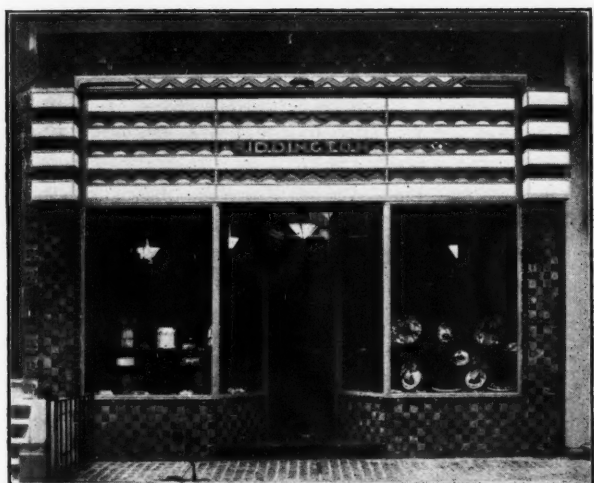


FIG. 12.—Riddington's, Dover Street. Day view.

The next illustration, of Riddington's Tea Shop in Dover Street (Fig. 12), is quite a recent example of the lighted shop front. White opal boxes, between which is placed patterned glass in colour, constitute the main features of the design. Behind the projection of the



FIG. 13.—Titania Palast, Berlin. Night view.

white strips at each end a diffusing glass box has been placed which after dark gives a red light. This installation, unfortunately, lacks effectiveness at night due to inadequate illumination, but the daylight appearance is good.

In Germany a very interesting solution of producing an effect at night may be seen in the interior and exterior of the Titania Palast. It will be seen from Fig. 13 that the horizontal opal boxes form the main feature of the exterior design, both by day and by night. The frieze is lighted from the top by lamps placed in a cornice, the lettering being lighted separately. The effect is very arresting, and is eminently suitable for cinema façades, where advertising pays an important rôle.

MODERN LIGHTING FITTINGS.

Simultaneously with the development of modern architectural lighting practice as already described, there has evolved a range of lighting fittings to accord with these modern conceptions. One might almost term these fittings as the necessary detail to architectural lighting. The design of these fittings is free and generally simple in character, the form of the fitting predominating. A further characteristic is the fact that there is a predominance of glass, and the tendency to employ a number of small lamps in the place of a few lamps of higher wattage, and frequently these fittings present quite an extensive luminous surface of low intrinsic brilliancy.



FIG. 14.—Horticultural Hall, Westminster. Restaurant Unit. (Easton & Robertson, Architects.)

While the best results are only obtained when these fittings are used supplementary to the main architectural lighting, there are many instances where modern interiors are exclusively lighted by such means. When used, however, to supplement the illumination provided from truly architectural lighting, these auxiliary fittings are not necessarily intended to augment the general lighting of the room, but are provided with a view to obtaining luminous decoration. Consequently, the question of the luminous efficiency of the fitting is, therefore, frequently secondary in importance to the richness and decorative effect obtained. On the other hand, when these fittings are called upon to provide general illumination, the question of luminous efficiency ranks at least equally with form, etc.

In a selection of these fittings there is almost unlimited variety, from those which rigidly take simple geometric shapes, and are otherwise simple in character, to those which are decorated by means of sand-blasted or enamelled designs.

MATERIALS.

The translucent materials employed for architectural lighting vary from the more complete diffusing material, such as opal glass, to the less completely diffusing materials, such as acid-etched or sand-blasted glasses. In fact, as a result of this new movement, glass in the hands of artists has shown commendable results, and designers are employing innumerable glasses of different textures and degrees of diffusion to give interesting

designs. In some instances, plate glass is used as the basis, and is decorated in various tones by all the known arts of etching or enamelling. In Germany, sheets of opal glass are being extensively employed to obtain architectural lighting effects, and its more complete diffusing properties enable it, in many instances, to give better results than can be obtained from sand-blasting and acid-etching. The process of enamelling glass is being perfected and it is possible that enamelled glass will be extensively used in the future.

In France in particular, pressed glassware is being used largely for lighting purposes. This glassware has been introduced in the forms of cubes, cornice units, picture rail units, lintel units, dentil units, column units, etc., and may be built up to serve many functions. For instance, the cubes may be built up in any desired shape, forming a ceiling fitting, floor standard, or a single cube may be incorporated in a table standard or wall bracket (see Fig. 15).

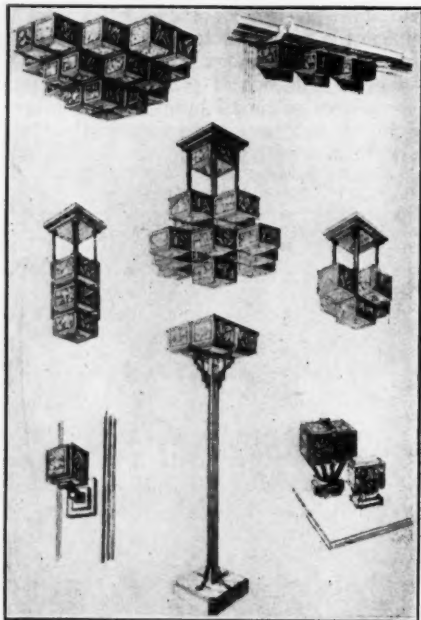


FIG. 15.—Shows Possibilities in Unit System. Glassware. (Sabino.)

Where the glassware has some definite decoration, care should be taken to install lamps so that they synchronize with the pattern. This is necessary to ensure that the brightly lighted areas bear some relationship to the pattern.

Unfortunately, illuminating engineers are considerably handicapped in the development of modern forms of illumination due to the lack of accurate data on the diffusing properties of their translucent materials. If some figure of merit for diffusion were available for the different materials, it would be possible to prescribe rules for positioning of lamps, their spacing, and their distance from the translucent surface to obtain visually even brightness or, at least, a known diversity of brightness.

ARCHITECTURAL LIGHTING DEMONSTRATION ROOM.

With a view to giving architects and engineers facilities to study these new methods of lighting, the Lighting Service Bureau has inaugurated an architectural department. This department has already collected much important data on the lighting of public and domestic buildings and has constructed a new lighting studio where some of the many aspects of architectural lighting are portrayed. In its conception the studio does not represent any particular interior, but is intended to show the effect of light in relation to space and the importance of combining the lighting as an intimate element in the architecture, and to this end various systems of lighting have been incorporated.

The room itself is roughly 450 feet square, and is generally finished in pale green, the detail work being picked out in other colours.



FIG. 16.—General View of Architectural Lighting Room.

Outside the entrance to the room, symbolizing the modern tendency, a distinctly novel porch fitting sheds a warm and inviting glow from its one-piece moulded glass surface. On entering the doorway the visitor finds himself in the tiny lobby decorated in the modern style and lighted by a squat cylindrical fitting of warm tinted glass mounted directly on to the ceiling, while two attractive wall brackets similar in style to the porch fitting give additional illumination if required. The main interior is reached through a low rectangular doorway, which at a touch of the switch is transformed into a radiant frame of light by the luminous panels which form the sides of the doorway. To walk through a luminous doorway for the first time is a stimulating experience.

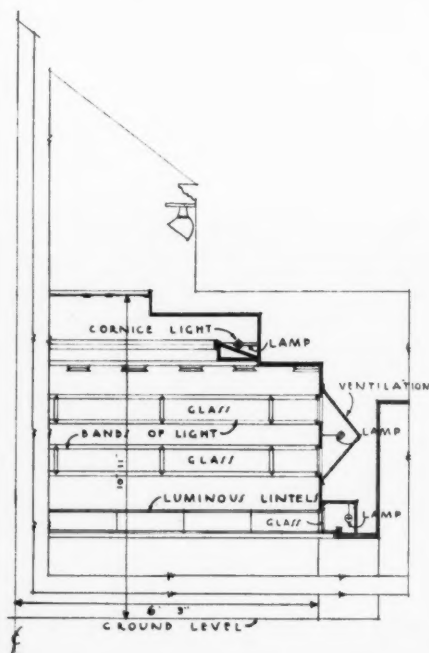


FIG. 17.—Section of Lighting Service Bureau. Architectural Lighting Room.

Fig. 16 shows a general view of the room and it will be noted that recesses have been planned to show modern applied fittings as the supplementary elements to architectural lighting.

The following represent the main systems of lighting installed, while Fig. 17 shows a section of the room indicating the method of application:—

- (1) Lighting from skylight.
- (2) Cornice lighting.
- (3) Luminous bands round the room.
- (4) Luminous lintels.
- (5) Lighting from doors and doorways.

Special arrangements enable the visitor to experiment with any of these methods of lighting.

The main interior presents many fascinating features of a distinctly novel character. The first thing to notice is the pleasing octagonal sub-skylight which forms a large part of the ceiling of the room.

Fig. 18 shows the room lighted from the skylight, cove and luminous lintel. The skylight is fitted with two types of diffusing glass, while the lamps are placed above in shop-window reflectors round the edge some 1 ft. 6 in. from the glass. The use of glass of different density and texture has value decoratively and at the same time masks any patchy lighting effects which may be unavoidable. When skylight lighting is being employed

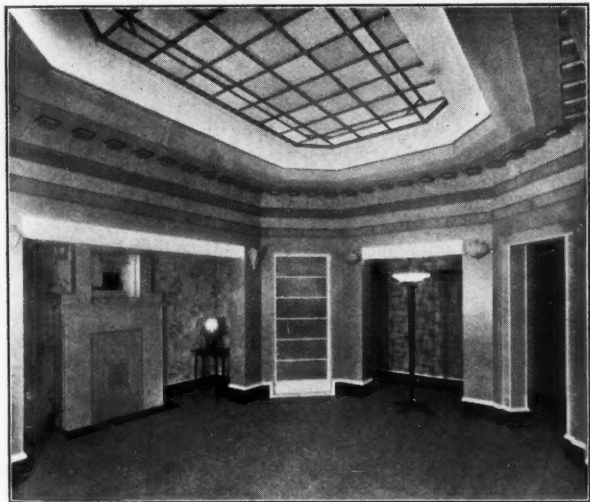


FIG. 18.—Showing the Architectural Lighting Room lighted from the skylight, cove and luminous lintel.

on its own, care must be taken to ensure adequate luminous intensity, since poor intensity gives a sense of depression. Two circuits, each of twenty-four 60-watt lamps, enable this effect to be completely demonstrated, while one of the circuits also permits the possibility of colour lighting to be investigated.

Under the skylight and forming a strip of ceiling round the room is a flat band which can be illuminated by the concealed light sources, forming, when the skylight is dark, a striking feature which gives considerable character to the interior.

This cornice lighting, based on the usual methods employing obscured lamps, only lights up a portion of the ceiling, thus giving an interesting effect.

Another source of illumination lending itself to infinite application is provided by the luminous lintels. The method adopted shows the placing of lamps behind the moulded glass, producing a series of bright spots, which, to be entirely successful, should synchronize with the design.

The use of high-intensity lighting from the other sources available brings about an apparent reduction in the brightness of the luminous lintels, an effect which is quite pleasing.

The next illustration (Fig. 19) shows the room lighted from the cornice, luminous doorway and applied fittings. The luminous doorway, while producing an effective frame, has not the same solidity as the flush luminous doorway on the other side of the room, but it nevertheless

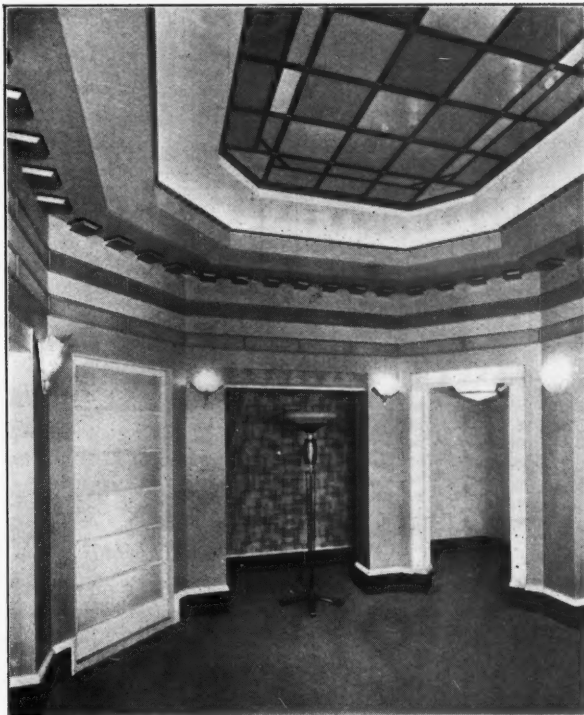


FIG. 19.—The same room lighted from cornice, luminous doorways and applied fittings.

less shows the possibilities of this type of lighting. Flashed opal glass is used for the front of the doorway, while frosted pinhead-morocco glass is used for the inner faces, the illumination being obtained from twenty-five 25-watt inside frosted lamps on approximately 6-in. centres, as shown on the detail drawing.

Below this ceiling and forming a continuous band round the walls are two rows of glass panels which are quite inconspicuous until illuminated, when they form two striking features which, by the effect they create, indicate the value of such built-in lighting in imparting character to the room.

The next illustration (Fig. 20) shows the room lighted by the cornice, the glass bands, and the flush luminous doorway. The method of construction of the bands is seen in the detailed drawing, and it will be noticed that the luminous panels are lighted by lamps in a simple white reflector. The effect is very pleasing, the surface brightness being comparatively low and all semblance of glare avoided. Seventy-nine 40-watt inside-frosted lamps on approximately one-foot centres are employed in this system.

The flush luminous doorway at the entrance lobby (Fig. 21) is composed of lamps placed behind frosted



FIG. 20.—Lighting from the cornice, glass bands and flush luminous doorway.

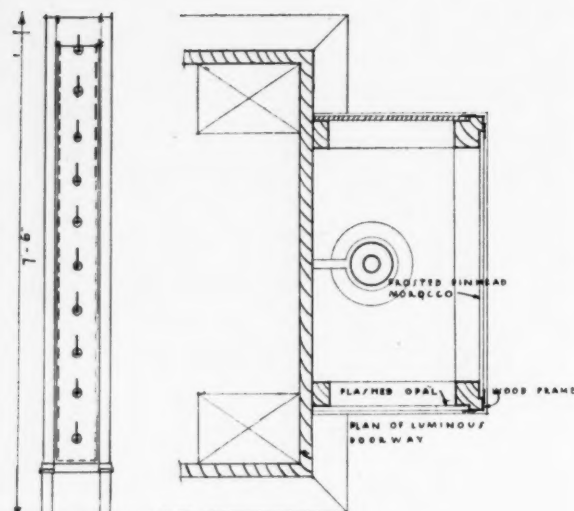


FIG. 21.—Plan and Elevation of Luminous Doorway.

pinhead-morocco glass and spaced vertically on approximately 9-in. centres. It is advisable in dealing with problems of this kind to construct a wooden reflector so that a maximum amount of light is attained. In this case a fairly satisfactory result is obtained within a box 9½ in. by 7½ in. For further details of this doorway see Fig. 22.

The recesses are used to display types of fittings for domestic use, interesting examples of applied lighting to bookshelves, shelves for ornaments, and a modern method for lighting mirrors.

It is the intention of the Lighting Service Bureau to develop this form of interior lighting and, by constant revision and re-arranging of this room, enable visitors who are interested in the possibilities of this new art in lighting to see for themselves the very latest practice.

It is hoped that architects and engineers will make use of this new demonstration room in the consideration of any schemes of interior lighting which they may be planning.

PROFESSIONAL RELATIONSHIPS.

When considering the application of architectural lighting, we have to bear in mind the following four conditions which control its introduction:—

1. Frequently the building has been completely constructed without any regard to lighting, and fittings are installed in a similar way to furniture by the incoming tenants, without giving any consideration to the architect.
2. The building may be completely constructed before the architect considers the question of lighting.
3. Conditions where the architect considers the lighting installation at an early stage in the design.
4. Buildings where lighting is an essential decorative unit, becoming an important feature in the architectural ensemble, as in illuminated cornices, panels, etc.

The first, unfortunately, is very prevalent in the smaller buildings of Europe to-day, but it is seldom that the architect does not give some kind of consideration to the lighting problem in large public buildings, although frequently lighting should secure attention at an earlier stage in the design.

With a knowledge of the fundamental principles of artificial lighting, the architect may "play" with it and achieve a variety of effects—either gaiety, sobriety, elegance, or grandeur—in other words, he can create atmosphere. It is essential, however, in this work that early collaboration should be obtained between the designer and the lighting specialist, and since the final effect is the only consideration the architect should inform the lighting specialist of his desired results, fixing the brightness for various surfaces, for shadows and the values of his colours. The lighting specialist should then be able to inform the architect concerning the size and position of the light sources, their number, the qualities of the diffusing and reflecting media available, and thus enable the architect to make necessary provision in the structure to house them.

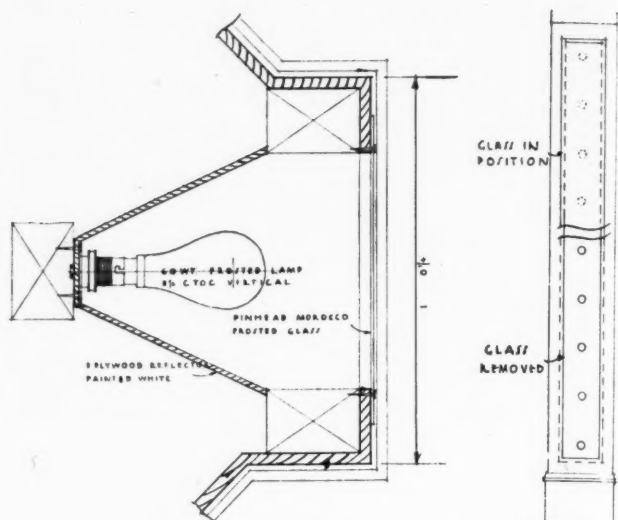


FIG. 22.—Plan and Elevation of Luminous Flush Doorway.

In conclusion I would suggest that in architectural lighting we have a logical way of introducing artificial light, and although there are many people who are sceptical about this new outlook I am convinced that, even with its limitations, it is a step in the right direction. Many critics of architectural lighting confine their criticism to the materials employed, but I feel that criticisms of this character do not in any way nullify the value of the principles involved. For instance, it is quite likely that moulded or sand-blasted glass may be superseded by opal or enamelled glass, but the general characteristics of architectural lighting in providing lighted surfaces of low intrinsic brilliancy is undoubtedly a rational solution to the problem of clothing electric light, and the methods employed have definitely architectural value.

The whole movement is as yet in its infancy, and its successful application is contingent upon the closest collaboration between the architect and the engineer.

Discussion

The discussion was opened by Mr. H. T. YOUNG, who has himself made a speciality of architectural-lighting methods. Other speakers included Mr. OLIVER BERNARD, Professor H. M. ROBERTSON (Principal of the Architectural Association), Mr. W. J. JONES, Mr. P. J. WALDRAM, Mr. A. W. BEUTELL, Mr. A. CUNNINGTON, Mr. J. M. WALDRAM, Mr. C. W. SULLY, Mr. J. WALKER and Mr. H. E. DOWLING.

An account of this discussion will appear in our next issue.

In concluding the proceedings, the PRESIDENT proposed a very cordial vote of thanks to Mr. Maitland for his original and interesting paper, and to the E.L.M.A. Lighting Service Bureau for their interesting demonstrations, which was carried with acclamation.

In the course of the proceedings the Hon. Secretary announced the names of the following applicants for membership:—

Ordinary Members—

Leach, G. W.....Electrical Engineer, 109, Downton Avenue, Streatham Hill, London, S.W.2.

Sustaining Members—

The British Commercial Gas Association, 30, Grosvenor Gardens, Westminster, S.W.1. (Representative: Mr. J. C. Walker.)

Messrs. L. G. Hawkins & Co. Ltd., 30, Drury Lane, London, W.C.2. (Representative: Mr. A. E. Blake.)

The names of applicants announced at the last meeting of the Society were read again, and these gentlemen were formally declared members of the Society.*

* *The Illuminating Engineer*, March, 1929, p. 59.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—
Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Floodlighting for Constructional and Evacuating Work

By H. LINGARD

(E.L.M.A. Lighting Service Bureau).

ORDINARILY, floodlighting conveys the impression of building front illumination for spectacular or commercial purposes, but although this is the most popular form (because the most obvious), there is a rapidly expanding field of application for light-projecting apparatus in industry.

It is the custom of the present age to throw up huge buildings at a rate which some years ago would have been looked upon as little short of miraculous, and it is in connection with such accelerated constructional work that the floodlight projector proves of such value.

Before considering the various applications it may be as well to consider what it is in the floodlight projector that renders it particularly suited to this class of work.

The chief characteristic that differentiates the floodlight projector from other lighting units is the fact that it is a beam-producing device capable of transferring the light emitted by the lamp in all directions on to a distant surface through the medium of reflectors of suitable contour.

Forms and types of projectors necessarily differ considerably to render them suitable for the wide range of problems which they are called upon to solve, but, generally speaking, for outdoor constructional work the projector must be of the most robust and flexible form to enable continuity of operation under arduous service conditions.

All projectors have certain features in common, and the essential apparatus consists of a light source, a reflecting system, a casing, a front glass, and some suitable system of mounting.

The light source employed is invariably a gasfilled lamp, either of standard form or of the round-bulb floodlight type. Lamps of less than 250 watts are rarely employed in modern projectors, the tendency being to employ a light source of the greatest possible power, thereby reducing the number of units necessary to a minimum. The floodlight projector-type lamp is specially designed with a very concentrated filament construction, which enables much narrower beams to be obtained than are possible with the standard gasfilled lamp, and the choice of units equipped with one or other of these light sources will depend, in industrial lighting problems, upon the distance from the light source to the working area; a narrower beam being necessary when this distance is greater.

The reflecting materials used in modern commercial floodlights are mainly of two kinds, namely, silvered glass and untarnishable metal, the latter usually being some stainless alloy plated on a steel or copper base. Each of these materials is, of course, made up into a wide variety of forms to suit the type of lamp employed and the beams spread requirements of each particular unit. As a rule, however, for outdoor constructional work a very wide beam is not called for, and this con-

sideration generally necessitates the use of projectors with reflectors built up or formed into approximately a paraboloid form.

The casing of the floodlight projector purely serves the function of a housing for rigidly supporting the optical elements and providing sufficient mechanical protection for these vital components. This casing, in conjunction with the front glass, renders the unit capable of maintaining a good performance under adverse weather and atmospheric conditions, and should be sufficiently robust to stand the hard usage inseparable from building operations. Cast-metal and sheet-metal cases are available, and the choice must depend on the nature and severity of the working conditions; cast cases being obviously superior to sheet metal where there is any likelihood of the unit receiving direct blows.



FIG. 1.—Night View during Construction of Epsom Grand Stand, showing effect of floodlighting.

For outside work the mounting of the units is particularly important, since the working area will usually move as the work progresses, and consequently it is desirable that the floodlight beam should be easily turned from one position to another. The tripod base and the cast base for bolting to part of the structure are the two varieties most serviceable for this kind of work, while the upper part of the mounting, which is directly concerned with carrying the projector body, should be of such a construction that the apparatus can be easily turned in either the vertical or horizontal planes.

Methods of Installation.—There are certain fundamental errors to avoid when employing powerful directional sources, such as floodlights for providing a working illumination; otherwise the lighting system may prove unsatisfactory, and in extreme cases positively dangerous. In common with nearly all artificial-

lighting problems, glare must be as far as possible eliminated in industrial systems of floodlighting.

It will be appreciated that to some extent glare is a necessary evil when lighting units giving very high intensity directional illumination are employed, but since it is usually possible to arrange for the units to be tolerably remote from the workers' line of vision the problem is not so insuperable as it may appear at first sight.

For evacuating work, where mechanical shovels and navvies are employed, one of the most effective methods of lighting is by projectors mounted directly on to the machines themselves, with the beams so trained that the tool point is brilliantly and effectively illuminated in all working positions. This system of lighting is, of course, quite simple if an electricity supply is available on the machine, and even in the event of there being no supply the lighting is so excellent when such a method is employed that the installation of a generator on the machine itself may be well worth consideration.

For the general illumination of the building site, floodlighting projectors should be mounted as high as possible on the scaffolds, upright members, etc., so that the beams are decidedly depressed, thereby reducing the possibilities of glare. The eye is protected by the brow from light falling from above, and consequently if the workman is looking horizontally or in a downward direction a system with the units mounted high up will not, as a rule, prove uncomfortable.

The illustration shows how effective a floodlighting treatment may be when the correct types of projectors are carefully installed, and even from the picture it will be appreciated that the possibility of accidents due to hampered vision is definitely obviated.

For outdoor work of this description floodlighting is immeasurably superior to any other system of illumination, and, although not as yet fully exploited in this country, it has nevertheless been employed with great success in a number of very important constructional works.

An industrial floodlighting installation of this kind is simple to install and operate, while, as the units are mounted well away from the working area, their freedom from possible damage is ensured, and any possibility of the operations being impeded by the presence of the projectors is eliminated.

"Illuminotecnica"—Another Lighting Journal

We have before us yet another addition to the journals dealing with lighting now published abroad, *Illuminotecnica*, edited by Sig. Enrico Castaldi and issued in Milan. The first number contains a series of articles dealing generally with progress in illumination and principles of good lighting and is fully illustrated. A feature is an article dealing with industrial lighting, in which good and bad methods are contrasted, and there are quotations from other journals, including our own.

Electrical Association for Women

Full particulars are now available of the One-day Conference arranged by the Electrical Association for Women on Tuesday, April 16th. A meeting will be held at the Hotel Cecil at 11.15 a.m. in order to review the work of the Association and to receive reports from branches throughout the country. At 1 p.m. there will be a luncheon at the Hotel Cecil, at which the President (Mrs. Wilfrid Ashley), Sir John Snell, Lt.-Col. K. Edgcumbe and others will attend. Subsequently a party will leave the hotel by motor coaches to visit the works of Messrs. Belling & Co. at Edmonton and Enfield, in order to study the manufacture of electrical "outlet" equipment. The day will be completed by a ball and cabaret show at the Hotel Cecil at 9 p.m.

Sheffield Illumination Society

The second lecture for session 1929 was held on the 25th February last in the Meeting-room of the Y.M.C.A., Fargate, Sheffield, when Mr. J. F. Colquhoun (City Lighting Engineer and Hon. President of the Sheffield Illumination Society) gave "A Talk on America," in which he outlined his experiences at the meetings of the International Commission on Illumination held in America in September last.

Mr. Colquhoun stated that the purpose of the International Commission on Illumination is to study all questions connected with the art of illumination and the sciences relating thereto, and to establish by suitable means international understanding on questions of illumination.

There were 72 delegates attending the meetings, showing the increased interest in illumination throughout the world, and, in addition, the International President (Mr. C. C. Paterson), the International Secretary (Dr. J. W. T. Walsh), and the International Treasurer (Mr. A. Filliel, of Geneva).

The lecturer also directed attention to the beautiful pillars made of concrete but with the appearance of granite, and the ornate lighting fixtures which do, in many cases, really add to the architectural beauty of the streets in America.

Mr. Colquhoun made an interesting comparison between Detroit and Sheffield, stating that in the former city the current consumption in one particular street was 92.6 watts per linear foot, as against 9.1 watts per foot in Fargate, Sheffield.

In America the shopkeepers realize much more clearly than the shopkeepers in this country the attractiveness of good street lighting, and they are willing to pay for those very ornate and expensive installations, the cost presumably being charged to their advertising account.

Mr. Colquhoun illustrated his lecture with a splendid collection of lantern slides, which were most interesting and instructive.

The President of the Society (Mr. W. Hughes) occupied the chair.

BOOKS by Leon Gaster and J. S. Dow

MODERN ILLUMINANTS AND ILLUMINATING ENGINEERING Second Edition.

This book deals impartially with modern systems of lighting—gas, oil, electricity, and acetylene—and discusses their practical applications. A feature is the variety of illustrations, many of them reproduced from photographs taken entirely by artificial light. The new edition has been brought into conformity with the most modern practice, and forms a complete work of reference.

CONTENTS: History and Development of Methods of Illumination—Gas Lighting—Electric Lighting—Oil, Petrol-Air Gas, and Acetylene Lighting—Illumination and the Eye—Colour and the Eye—Measurement of Light and Illumination—Globes, Shades and Reflectors, and Calculations of Illumination—Problems in Interior Illumination—Outdoor Lighting—Searchlights and other Appliances for the Projection of Light—Index.

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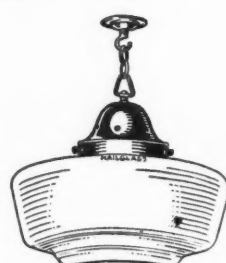
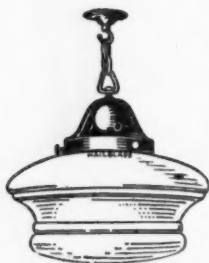
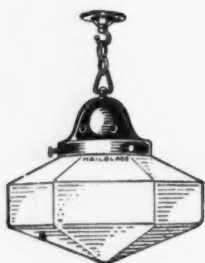
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Electrical Development Association

ANNUAL DINNER, MEETING AND REPORT.

The E.D.A. annual dinner, which was held at the Piccadilly Hotel on March 14th, proved to be quite as successful as in former years, over 300 guests being present.

The toast of the Association was proposed by Lord Birkenhead, who referred to the pioneering work of the father of Sir John Gatto, who presided. Lord Birkenhead made some reference to a somewhat debatable problem—the question whether the introduction of foreign capital into this country should be encouraged or the reverse. He drew attention to the vast future possibilities of electricity, and congratulated the Association on the excellent propaganda work which it was doing.

Sir John Gatti, who responded, remarked that Lord Birkenhead had given the electrical industry the striking recognition of selecting this as an avenue for his own efforts, and Mr. J. W. Beauchamp, in proposing the health of the guests, emphasized the importance of the modern conception of "service."

A dance followed the dinner, and the guests dispersed feeling that they had passed an exceptionally pleasant evening.

At the annual meeting, on the following day, fuller details of the work of the E.D.A. were given in the annual report. This report shows continually increasing activities. Allusion was made to the work of the sub-committees operating in various areas, and to the numerous conferences, exhibitions and discussions organized during the past year. The factory and workshop campaign, which is singled out for special mention, has had very encouraging results. It is understood that during the present year a continuous programme will be kept going. During the past year approximately three million pamphlets were sold.

Tungsten Filament Electric Lamps

BRITISH STANDARD SPECIFICATION NO. 151, 1928.

The recent issue of the above British Standard Specification for Electric Lamps illustrated several improvements in lamp manufacture which deserve notice. The specification reflects the results of much of the research work carried out in recent years by the British manufacturers. As a result, the efficiencies of gasfilled electric lamps have been substantially increased whilst still retaining the average life of 1,000 hours. It has also been found possible to keep the light-centre length constant within less than half the variation found necessary in 1925, when this specification was last revised. This last point is one of considerable importance to makers of illuminating glassware and reflectors, the performance of which depends in a large measure on the position of the filament with respect to the reflecting surface.

Sales of Lighting Fittings in the United States

According to the *Transactions* of the Illuminating Engineering Society (U.S.A.), approximately 250 million dollars' worth of lighting fittings, a new record, were manufactured in the United States last year. About a quarter of these fittings were for domestic use, commercial lighting fittings (18 million) coming next, and then street-lighting fittings (11 million).



From an untouched photograph.

Gas Publicity at Newcastle

Floodlighting of Advertising Sign

(Communicated.)

THE attractive "Mr. G.A.S." advertisements which have done so much to popularize the use of smokeless fuel are now familiar to all who read the daily press and weekly periodicals.

Adaptations of some of these advertisements are now appearing day and night on a hoarding 28 ft. long by 8 ft. deep set up within the grounds of one of the works of the Newcastle-upon-Tyne and Gateshead Gas. Co., adjoining Howdon Station.

The sign is raised above wood railings 6 ft. high bordering a path running parallel to the station platform, and is fixed four feet back from the wood railings. It can be read easily by many of the passengers in the trains which pull up at the station.

The background of the sign itself is white, so that the sign stands out particularly well at night against the surrounding darkness. The sign is illuminated by gas. The lighting box, made of galvanized iron, measures about 28 ft. long and is raised approximately 4½ ft. from the ground. This box is provided with thirty-three 3-light superheated bas burners with reflectors, fixed about 9 ins. apart. A tinned reflector runs along the whole length of the base of the box, and is fixed at an angle which ensures the best distribution of light over the surface of the sign. The box has a glass frontage—facing the poster, of course. A ventilating flue is carried right along the top of the box, and this has three outlets at the top and one at each end. A 1½-in. iron supply pipe runs along the inside base of the lighting box, and this feeds 11 standards, each of which in turn supplies three burners fitted with by-passes.



A View by Daylight of the Hoarding shown above, but with a change of Poster.

The total candle-power of the burners is approximately 4,000, and the running cost for gas is 6d. per hour. The sign is lighted up at dusk each evening by a workman and is turned out at about 11 p.m.

Although this system of lighting is at the moment in an experimental stage, the effect already achieved is good. The fixing of the lights at a point *below* the poster has the advantage that the sources of light are completely hidden from the view of people looking at the advertisement. The illumination on the surface of the board is absolutely even. The wood railings almost completely hide the lighting box.

The poster is changed about once a month. Where signs of this kind are of attractive design, and are so placed that they do not spoil the countryside, as the Newcastle undertaking has been careful to ensure, there is nothing but commendation for this method of publicity.

Self-Help in Industry

Some sound advice on the above subject was contained in the recent address delivered by Mr. F. W. Goodenough, as President of the British Export Society. He urged that what industry needed most was not State help, but self-help.

This same text of "self-help" was preached by Mr. W. M. Mason at a meeting of the Kent Salesmen's Circle, held in Chatham on February 13th. Educational facilities, he remarked, are of vital importance. But the essential qualification for the individual must spring mainly from the mental determination to help himself. As an instance Mr. Mason drew attention to the attitude of many gas undertakings towards the lighting load. The retention of this business depended on the efforts of the actual seller. The employment of special lighting salesmen would do much to retain the business. Mr. Mason continued: "We do not stand for the indiscriminate advocacy of gaslighting in all and every situation where artificial illumination is required. We are convinced that such advocacy does more harm than good." But he believed that there were ample opportunities still for gaslighting, and no gaslighting salesman need stand helpless and watch his lighting load disappear. He emphasized the importance of "service," and referred to the numerous leaflets which the B.C.C.A. had prepared illustrating various aspects of lighting with gas.

TRADE NOTES & ANNOUNCEMENTS

ELECTRIC LIGHTING GLASSWARE AND BOWL FITTINGS.

We recently received from Lighting Trades Ltd. a catalogue under the above title (No. 352), which is devoted entirely to shades and glassware. Ordinary, satin-finished and crystal glass is well represented, and there is also a good range of enclosed diffusing units for commercial lighting. The most interesting section of the catalogue, however, is that devoted to painted and decorated shades. Lighting Trades Ltd. follow the now usual practice of including colour-printed pages illustrating glassware of this description. Such shades are

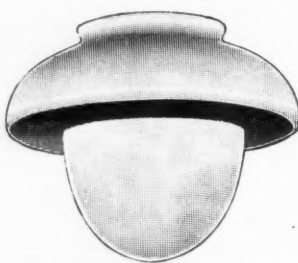


FIG. 1.—Some Pleasing Forms of Decorative Glassware

becoming increasingly popular, and represent a great advance on the types met with in the average home until a few years ago. In the accompanying illustrations we reproduce a few of the types of glassware covered in this list.

COLOUR LIGHTING FOR STAGE AND CINEMA.

The last issue of *Holophane Illumination* is attractively got up to illustrate the application of coloured light on the stage and at the cinema theatre. An introductory article traces the part played by colour in the arts, its application to the drama and its use in the modern cinema as a supplement to the film. There is also an illustrated article dealing with stage equipment and a contribution on colour lighting by Mr. Harold Ridge. The remaining pages contain pictures of lighting schemes in a number of leading cinema theatres, in general based on the use of colour units recessed in the ceiling. There is also an account of the colour-lighting entertainment stages by Holophane Ltd. in the small theatre attached to the Electrical Exhibition at Swansea last year—a highly novel and enterprising effort which attracted a considerable amount of attention at the time.

LIGHTING DATA FROM SWITZERLAND.

It is always interesting to study the development of lighting in other countries. We have received a series of booklets from Messrs. B.A.G., Turgi, which compare quite well with similar data issued in this country. A leaflet before us contains the usual definitions, tables of lighting intensities and data enabling illumination to be calculated, and we understand that the numerous polar curves of light distribution were obtained in the company's own laboratory. Numerous types of enclosed diffusing fittings are illustrated, some of these, e.g., the conical and cylindrical types, being familiar abroad but less usual in this country. Other booklets contain effective illustrations dealing with the lighting of shop windows and factories. We notice several familiar illustrations, notably the curve relating to the number of accidents to the month of the year, which show how widely distributed such "ammunition" is becoming!

THE FLOODLIGHTING OF HOTELS.

Floodlighting of leading stores and business premises has already become a familiar feature in this country. It has, however, only occasionally been applied to hotels, which offer considerable opportunities for this treatment. We recall that, on the occasion of the meeting of the Association of Public Lighting Engineers in Brighton in 1927, it was suggested that the parade would be much more impressive by night if the hotels were floodlighted. Certainly floodlighting offers a new means of attracting summer visitors. Our attention has been drawn by the General Electric Co. Ltd. to the enterprise of

the Claremont Hotel, Southport, the entire frontage of which is lighted up by 500-watt floodlight units, mounted 30 ft. apart. The hotel stands out very effectively from its surroundings, and as most seaside resorts have a long series of competing hotels side by side it may be assumed that on the whole the establishment which most readily catches the eye is most likely to get custom. An alternative form of device is the floodlighted flag, a good example of which is furnished by the Ambassadors Hotel, in Upper Woburn Place.

NEWS FROM VERITYS LTD.

Information has reached us of various developments in connection with the provincial centres of Messrs. Veritys Ltd. In Leeds Messrs. Veritys Ltd. have taken additional premises at No. 7, New Station Street, to deal exclusively with the plant and switchgear side of their business, and of which section Mr. R. J. Millard takes charge, still retaining Mr. R. D. Fairclough at 11, New Station Street, for the "Maxlume" fittings and fires; we note that Mr. Pearson has joined the staff for this purpose. In Manchester Mr. Hoyle and Mr. Richard have joined the Manchester staff to deal with the new range of "Maxlume" fires and fittings, for which additional premises have been acquired. In Newcastle Mr. H. S. Stoppard has joined the staff to take charge of the "Maxlume" fires and fittings, for which additional premises have been acquired.

BACK NUMBERS OF "THE ILLUMINATING ENGINEER."

We frequently receive requests for back numbers of "The Illuminating Engineer," some of which are now out of print. At the moment we have a demand for the following numbers:—

December, 1928
February, 1922

August, 1922
September, 1922

We should be glad to hear from any subscribers who are able to offer us these missing copies, and we should also be prepared to receive offers for other journals for the period 1918 to 1923.



REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

MODERNE LICHTTECHNIK IN WISSENSCHAFT UND PRAXIS. Prof. Dr. J. Teichmüller; 125 pp., 90 figs. Publishers: Union Deutsche Verlagsgesellschaft, Zweigniederlassung, Berlin.

This handy-sized book, the first of a series dealing with light technology, is issued by the German Illuminating Engineering Society, and is one that should be in the possession of everybody interested in the application of natural or artificial light to illumination. The full title, when translated, reads "Modern Light Technology in Theory and Practice, exemplified by an account of the technological display of lighting at the Gesolei Exhibition held at Düsseldorf," and thus so fully recounts the nature of the contents that any comments may seem superfluous. The fact of the book having been prepared by the well-known professor who directs the Light Technological Institute at Karlsruhe enhances its interest. Professor Teichmüller was responsible for the light-technological section of the important and novel exhibition held in 1926, an exhibition planned to comprise every aspect of the requirements desirable for human welfare. The addition of ninety appropriate pictures, plans, diagrams and curves renders the volume of value even to those who do not read German, while the price (which is not stated) cannot be prohibitive, the binding being a simple paper one.

The two introductory chapters include an account of the original plan elaborated by Professor Teichmüller, explaining how the scope of the light exhibits was limited by conditions beyond his control, and make it clear that the important branches of light therapy and light hygiene are excluded, and that the subject of street lighting could only be exemplified by small-scale models.

The contents then follow the logical sequence in which the exhibits were placed in the thirty-seven rooms that were available in the isolated building which was constructed for the world's first comprehensive illumination exhibition. Each room dealt, as far as was possible, with an individual feature of light technology, and the mapped-out course of perambulation through the rooms naturally commences with basic principles; consequently the earlier chapters, describing the first entered rooms, are confined to the physical, physiological and technical groundwork of the subject. Radiation, light projection and illumination demonstrated by pictures, diagrams and apparatus in actual use led the way to a historical display of illuminating devices, as used throughout the ages, followed by a demonstration of those peculiarities that accompany vision, such as the effect of intensity of illumination on the rapidity of observation, the nature and results of glare, colour discrimination, etc., until one arrives, by easy stages, at the principles involved in the enclosures which surround the light source in order to secure the best utilization of its intrinsic properties, whether obtained by diffusion, diffraction, reflection,

or by the intervention of colour filters, not omitting discussion of what is called the quality of the illumination produced by different placing and different design of the illuminating body and the general adaptability of light to both economic and artistic purposes.

The theoretical considerations are simply stated and enforced by conveniently placed illustrations constituting a good preliminary to the latter part of the book, which is concerned with the application of light to practical illumination purposes.

The second section is divided into chapters dealing with (a) light as a working tool used to obtain better and cheaper production, (b) light for every kind of intercourse, (c) light in its relations to the arts. The use of light as a working appliance was demonstrated in the widest possible sense by showing its use in factory, workshop, office, sales and domestic working premises, arranged as they usually would be, while under the head of intercourse every variety of transit, either of living or inanimate matter, was considered, and one room was devoted to what might be called special applications, among which the illumination of staircases was made a prominent feature. The value of suitable illumination for producing artistic effects on the stage, in show windows and in conjunction with painting and sculpture is carefully and amply dealt with, while the effects obtainable by the projection of ordinary and tinted light on plain surfaces, so as to secure picturesque effects, is illustrated together with a special pattern of lantern for this purpose that was fitted in the cupola of the lecture room.

Such a comprehensive exhibition could not have been achieved without the aid of competent and willing assistants, of manufacturers of illuminating and other devices prepared to co-operate in this logically ordered exhibition of light, its measurement and utilization, and the book therefore closes with a detailed acknowledgment of these collaborators, giving a good glimpse behind the scenes, and here as elsewhere shows the author's desire to support the proper use of light and not merely to make a classical addition to illumination literature, but to perpetuate, if possible, a standardized arrangement of light-technology exhibitions, so that future ones may be carried out on a comparative basis, and only enlarged and modified in those parts where improvements in light sources and uses and wider scientific knowledge are available.

It is to be regretted that so long a period has elapsed since the exhibition was held, as much knowledge and experience has been gained in the interval, and the claim to modernity cannot be fully upheld, although it is partially substantiated by the use of technical terms that have not yet had full acceptance by all German illuminating engineers.

J. E.

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SINCE the year 1909, when the Illuminating Engineering Society was founded in London, it has been the official organ of the Society.

It is the only journal in this country exclusively devoted to Lighting by all Illuminants.

IT receives the assistance of contributors who are leading experts on illumination in this country and abroad. Foreign Notes and News will be a speciality, and correspondents have been appointed in all the chief cities of the world.

THE Journal contains *first-hand and authoritative information on all aspects of lighting*; it has also been improved and extended by the inclusion of a *Popular and Trade Section* containing special articles of interest to contractors, gas and electric supply companies, Government Departments and members of the Public.

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The Society preserves an impartial platform for the discussion of all illuminants, and invites the co-operation both of experts on illumination and users of light; it includes amongst its members manufacturers, representatives of gas and electric supply companies, architects, medical men, factory inspectors, municipal officers, and many others interested in the use of light in the service of mankind.

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